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June 24, 2021

Mr. Kenan Cetin
West Virginia Department of Environmental Protection
Division of Water and Waste Management
131A Peninsula Street
Wheeling, WV 26003

Subject: 2020 Operation, Maintenance, and Monitoring Activities Memorandum
Union Carbide Corporation Institute Facility, Institute, West Virginia
(Permit ID# WVD005005509)

Dear Mr. Cetin,

Enclosed for review is the 2020 Operation, Maintenance, and Monitoring Activities Memorandum for the Union Carbide Corporation Institute Facility in Institute, West Virginia. The information presented herein was completed in accordance with the May 2019 Operation, Maintenance, and Monitoring Plan.

If you have any questions or would like to discuss this document further, please contact me at 989-638-9038 or Paul Weber/Jacobs at 269-762-3433.

Sincerely,

A handwritten signature in blue ink that reads "Betsy Witt". The signature is written in a cursive style with a large, stylized "B" and "W".

Betsy Witt
UCC Remediation Leader

cc: John Hopkins/USEPA
USEPA Region 3 File Repository
Paul Weber/Jacobs

Certification Statement

I certify that the information contained in or accompanying the 2020 Operation, Maintenance, and Monitoring Activities Memorandum are true, accurate, and complete to the best of my knowledge.

As to the portions of the this report for which I cannot personally verify their accuracy, I certify under penalty of law that this report and any attachments were prepared in accordance with procedures designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person responsible for gathering the information, or the immediate supervision of such person(s), the information submitted is, the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of the fines and imprisonment for knowing violations.

Signature:	
Name:	Betsy Witt
Title:	UCC Remediation Leader
Date:	6/24/21

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Subject	2020 Operation, Maintenance, and Monitoring Activities Memorandum
Project Name	Union Carbide Corporation Institute Facility, Institute, West Virginia
Attention	Kenan Cetin
From	Jacobs
Date	June 2021

This annual technical memorandum (TM) summarizes operations, maintenance, and monitoring (OMM) activities completed in 2020 for the corrective measures at the Union Carbide Corporation (UCC) Institute Facility (hereafter referred to as the facility) in Institute, West Virginia (Figure 1). The corrective measures for the facility were specified in the Final Decision issued by the U.S. Environmental Protection Agency (USEPA) in October 2018 (USEPA 2018). As prescribed in the Final Decision, a State Corrective Action Permit was issued by the West Virginia Department of Environmental Protection (WVDEP) on February 22, 2019, to require implementation of the final remedy.¹

1. Background

Corrective measures at the facility requiring ongoing OMM activities are presented in the *Corrective Measures Implementation Work Plan* (Jacobs 2019b) and are summarized in the following sections. Additional site background and historical information are included in the *Corrective Measures Study* (CMS; CH2M 2018a). An overview of areas requiring ongoing OMM activities is provided on Figure 2.

1.1 Groundwater Monitoring

Sitewide groundwater monitoring is conducted in accordance with the *Sitewide Groundwater Performance Monitoring Plan* (Jacobs 2019a) and is reported separately in the *2020 Groundwater Performance Monitoring Report* (Jacobs 2021).

1.2 SWMU 1

Solid Waste Management Unit (SWMU) 1, former UCAR Carbon Company Landfill, is a closed landfill that has a gravel cover and is crossed by one rail line. Periodically, a black, tar-like substance seeps to the surface of the gravel cover over the landfill. The tar-like substance most frequently appears during periods of hot weather and results in tar-like deposits on the ground surface (CH2M 2010).

¹ UCC sold the facility to Altivia in 2019; however, UCC retained responsibility for conducting corrective actions at the facility in accordance with WVDEP Corrective Action Permit.

1.3 SWMU 2 & 6

SWMUs 2 and 6 (Number [No.] 2 Ash Pond and No. 2 Fly Ash Landfill) are managed together as a closed landfill with a soil cover. The No. 2 Ash Pond was constructed over a portion of the closed No. 2 Fly Ash Landfill. In 2018, the No. 2 Ash Pond was permanently closed by removing the contents to the base of the pond, covering it with 1 foot or more of clean clay, and providing topsoil and a vegetated soil cover to match the existing closed landfill.

1.4 WWTU Closed Ponds

The wastewater treatment unit (WWTU) area includes six Resource Conservation and Recovery Act (RCRA)-closed ponds (No. 2 Sludge Pond, Former Biobasin No. 1, Former Biobasin No. 2, Former Biobasin No. 3, Former Equalization Basin, and Former Panic Pond Area) and three non-RCRA closed ponds (No. 1 Sludge Pond, No. 3 Sludge Pond, and the Former Pond) formerly associated with the WWTU. The current WWTU was built over the Former Pond, the Former Equalization Basin, and the western portion of the Former Panic Pond; therefore, the soil covers are not accessible at ground surface because they are beneath concrete and/or infrastructure associated with the WWTU.

1.5 SWMU 11

SWMU 11, former Chemfix Landfill, is a closed landfill with a soil cover.

1.6 CMS Area A

CMS Area A consists of SWMU 18, SWMU 22, and Area 3 (the former Fluorocarbon Area and associated units). A groundwater remedy consisting of aerobic co-metabolic bioremediation (ACB) via enhanced biosparging (BS) is currently operating at Area 3 to treat the constituents of concern (COCs) in groundwater (carbon tetrachloride, chloroform, tetrachloroethene [PCE], and trichlorofluoromethane [TCFM]).

1.7 Tank 1010

The Tank 1010 area, within CMS Area B, includes a technical impracticability zone for contaminated groundwater that was established by USEPA because it is not practical from an engineering perspective to remediate the area.

1.8 Institutional Controls

The final remedy includes land and groundwater use restrictions to be implemented at the facility and at the following locations where facility related COCs have migrated:

- Southwestern portion of West Virginia State University (WVSU)
- Appalachian Power Company (APCO)
- Norfolk Southern (NS) Property

Institutional controls (ICs), discussed in detail in the Corrective Measures Implementation (CMI) Work Plan, fall into four categories: (1) groundwater use restrictions, (2) vapor intrusion restrictions, (3) subsurface work restrictions, and (4) land use restrictions (e.g., commercial/industrial use).

2. Landfill Inspections

Landfill inspections were completed quarterly to evaluate the condition of the fencing and soil covers.

2.1 Fence Inspection

Perimeter fencing is in place to restrict access to the main chemical plant and the WWTU. SWMU 1 is also enclosed by perimeter fencing specific to the SWMU to prevent unauthorized access. The SWMU 1 fence includes two gates associated with the rail line to allow railroad access through the SWMU. Gates to the main chemical plant, WWTU, and SWMU 1 are kept locked and warning signs are posted to restrict access.

The perimeter fence associated with the main chemical plant and WWTU is inspected by Altivia. The SWMU 1 fence, warning signs, and gates were inspected quarterly by Jacobs and documented on the inspection checklists in Attachment 1.

2.2 Soil Cover Inspection

The gravel cover over SWMU 1 and the soil covers over SWMUs 2 and 6, SWMU 11, and the closed ponds were inspected quarterly in 2020. Inspection activities consist of a walking survey to identify signs of damage to the soil covers (e.g., erosion, furrows, ruts, or animal burrows). Documentation from the inspections is included in Attachment 1.

The Former Pond, Former Equalization Basin, and the western portion of the Former Panic Pond Area are covered by concrete and/or infrastructure associated with the active WWTU. Inspection of these former ponds includes a visual survey to identify any areas in which damage to the concrete or WWTU infrastructure is present and could expose the underlying soil cover or waste material. The quarterly inspections were completed and documented on the inspection checklists in Attachment 1. During the third quarter inspection erosion damage around the surface drain at SWMU 11 was noted and repairs were completed in December 2020.

2.3 Institutional Controls Inspections

ICs will be implemented through the use of environmental covenants that are currently being prepared in accordance with the Uniform Environmental Covenants Act, West Virginia Code Chapter 22, Article 22B. If environmental covenants cannot be implemented for the offsite properties, WVDEP may decide to implement the ICs through an enforceable order.

IC inspections were not completed in 2020 at the NS, WVSU, and APCO properties and will not be completed in the future until the environmental covenants have been signed by all required parties and recorded and/or access is granted by the respective property owners.

Quarterly IC inspections were completed in 2020 for the facility and consist of a combination of driving surveys, walking surveys, and records searches to verify the ICs are being followed. No violations of the ICs were observed. Documentation from the inspection is included in Attachment 1.

3. CMS Area A

The ACB system consists of two complimentary processes: continuous injection of ambient air into the aquifer (BS) and periodic injection of a soy-based biodegradable substrate, SoyGold 5000, to facilitate ACB of the COCs. Aerobic conditions, maintained by BS, support biodegradation of the highly degradable

SoyGold 5000, and generate enzymes capable of breaking the molecular bonds of the COCs. The system was designed to treat the COCs in groundwater within Area 3, which are chloroform, carbon tetrachloride, PCE, and TCFM. Area 3 is divided into Subareas 3A, 3B, 3C, and 3D based on historical operations and the presence of potential source areas. Within each subarea, target treatment zones (TTZs) were developed to refer to the areas in which active remediation would be conducted. The TTZs are shown on Figure 3.

The four subareas encompass a total of 191 biosparge wells, 32 performance monitoring wells, and 40 pressure monitoring points. Vapor intrusion mitigation systems (VIMS) were installed as a precautionary measure at occupied structures in CMS Area A (Building 137 and Building 332) to maintain a negative pressure in the subgrade below the buildings as part of the remedy implementation.

3.1 Performance Criterion

The purpose of establishing a performance criterion is to measure the operational effectiveness of the ACB remedy and evaluate whether to modify or optimize the current system, transition to an alternate remedy, or to shut down the system. The performance criterion for the ACB system is to operate each of the four areas until mass reduction for total COCs in groundwater becomes asymptotic.

3.2 System Operations

Remediation systems in Areas 3A through 3D were started at different times, following the completion of construction and startup activities. Areas 3B and 3D started in December 2015, followed by Area 3C in October 2016 and Area 3A in August 2017. Plant-supplied air has allowed for the ACB system to run almost continuously, with little downtime. The 2020 monthly runtimes for Area 3D are presented in Tables 1. The ACB system in Area 3D was operational in 2020; Areas 3A and 3C were shut down to evaluate rebound in December 2019. Area 3B, was shut down fully to evaluate rebound in March 2019.

The VIMS in Building 137 and Building 332 were inspected monthly in 2020. The monthly inspection of the VIMS confirmed the systems were operating and did not identify any issues with these systems.

3.3 Groundwater Performance Monitoring Field Activities

Groundwater monitoring wells used to monitor the performance of the ACB systems are shown on Figure 3 and are detailed in Table 2. Water level measurements were collected quarterly from the monitoring wells during the groundwater sampling events (Table 3). The monitoring wells were gauged using a handheld electronic water level meter. As noted in Table 3, water levels could not be collected from some of the monitoring wells because they were not accessible during the groundwater sampling event.

Groundwater samples were collected quarterly from the monitoring wells associated with each area. Table 4 presents the water quality parameters measured in the field. Some monitoring wells not sampled in 2020, as noted on Table 4, were not accessible during the groundwater sampling event. The limited number of monitoring wells that could not be sampled in 2020 did not affect the evaluation of remedial performance for the ACB systems.

The groundwater samples were collected using the low-flow groundwater sampling technique described in the standard operating procedures included in the *Sitewide Groundwater Performance Monitoring Plan* (Jacobs 2019a). Samples were analyzed for volatile organic compounds using USEPA Method 8260C.

3.4 Groundwater Sampling Results

The groundwater COC concentrations reported since startup are detailed on Tables 5 through 8 for Areas 3A through 3D, respectively.

The 2020 groundwater data were validated using the precision, accuracy, representativeness, completeness, and comparability (PARCC) criteria outlined in the Quality Assurance Project Plan (CH2M 2018b). The laboratory reports and data validation report for the 2020 data are provided in Attachment 2. Overall, data quality is acceptable, and the results may be used in project decisions taking into consideration the potential biases and validation flags applied to the data set.

3.5 Performance Evaluation

Trend graphs depicting COC concentrations inside and outside the TTZ for each area are presented as Figures 4 through 11. The trend graphs show that COC concentrations inside and outside the TTZ in each area demonstrate an overall decrease since the remedial systems were started with few exceptions:

- Two monitoring wells (TW-98B and TW-99A) inside Area 3B, which was shut down fully to evaluate rebound in March 2019, showed increases in concentrations of TCFM and slight increases in concentration of chloroform throughout 2019 and 2020.
- TCFM in one well (TW-101B) located outside Area 3B TTZ was not detected during baseline sampling prior to system startup; however, increased significantly in the next two sampling events after system startup (maximum of 103,000 micrograms per liter in May 2016). TCFM concentrations at TW-101B have fluctuated since May 2016 but have generally decreased over time.
- Carbon tetrachloride and chloroform concentrations in TW-97B (located outside the Area 3B TTZ), were relatively stable in 2020.
- PCE concentrations in 2020 were relatively stable at wells located inside and outside the Area 3C TTZ, with the exception of TW-122B, which showed an increasing trend in 2020.
- COC concentrations were relatively stable in wells located inside the TTZ in Area 3D in 2020.

As discussed in the CMI Work Plan, the Thiessen polygon method (USEPA 1998) was selected to assess and document the total mass of COCs removed from groundwater within each subarea. The Thiessen polygon method is a spatially integrated approach that assumes each area of contamination can be represented by polygons of defined area, aquifer thickness, and concentration. The polygons (also called Voronoi polygons) are obtained using the well network and the boundary of each subarea. The distribution of the Thiessen polygons for the ACB systems and the monitoring wells associated with each polygon is shown on Figure 3.

The Thiessen mass plots are presented on Figure 3-1 in Attachment 3 showing total COC mass reduction over time. In all four subareas, 3A through 3D, the COC mass has been significantly reduced by operation of the ACB systems. Reduction in the total COC mass appeared asymptotic for Areas 3A, 3B, and 3C; therefore, as discussed above, these systems were shut down in 2019 to evaluate rebound. At Area 3D, the total COC mass appeared to be increasing after the system was partially shutdown in February 2017, so the system was restarted and SoyGold 5000 was injected in October 2019. Area 3D showed a decrease in COCs after the system was restarted in 2019 and the reduction in the total COC mass appeared asymptotic; therefore, it is recommended that the Area 3D system be shut down for another rebound assessment.

The Mann-Kendall test (Gilbert 1987) was used to evaluate the temporal behavior of the total mass of COCs in groundwater within each subarea (calculated using the Thiessen polygon method) after system

shut down. The Mann-Kendall test is a nonparametric procedure used to identify whether there is a statistically significant trend over a period of monitoring. The test is based on the idea that a lack of trend should correspond to a time series plot fluctuating randomly about a constant mean level, with no visually apparent upward or downward pattern (USEPA 2009). As a nonparametric procedure, the Mann-Kendall test does not require the underlying data to follow a specific distribution.

The calculated probability (p-value) for the Mann-Kendall test represents the probability that any observed trend would occur purely by chance (given the variability and sample size of the data set). A significance level of 0.1 to 0.05 (i.e., 90 to 95 percent confidence) was used to test the null hypothesis that there is no trend in the data. The significance level is the probability that a test erroneously detects a trend when none is present. For this rebound assessment, the calculated Mann-Kendall probability (p-value) was interpreted as follows:

- A strong trend (either increasing or decreasing) is indicated by a confidence level greater than 95 percent.
- A weak trend (either increasing or decreasing) is indicated by a confidence level less than or equal to 95 percent but greater than 90 percent.

For monitoring wells where no trend could be statistically determined at the 90 percent confidence level, concentrations were deemed stable if the coefficient of variation (CV) was less than one. The CV is a statistical measure of how the individual data points vary about the mean value and is defined as the standard deviation divided by the sample mean (USEPA 2009). The CV is a relative measure of variation in groundwater concentration data.

Results of the Mann-Kendall test performed for total COC mass in each TTZ after system shutdown is provided in Table 3-1 of Attachment 3. A strong increasing trend in total COC mass was observed for Area 3B; however, total COC mass was identified as stable (no trend and CV less than 1) for Area 3A and Area 3C. It should be noted that the sample sizes for the post-shutdown trend analysis ranges from four for Area 3A and Area 3C to six for Area 3B. Although the Mann-Kendall test can be performed with four independent results, the statistical power of the test with so few samples is expected to be low. Thus, the trend analysis results presented in Table 3-1 of Attachment 3 should be considered cursory until more samples can be collected to adequately evaluate the temporal behavior of total COC mass in each subarea.

Because the post-shutdown total COC mass was identified as increasing in Area 3B, the Mann-Kendall test was conducted on the individual COCs in each well in this area. The results, shown in Table 3-2 of Attachment 3, indicate a strong increasing trend in total COC concentrations for both wells (TW-98B and TW-99A) used to calculate total COC mass for Area 3B. Concentrations of trichlorofluoromethane are increasing in TW-98B whereas concentrations of chloroform and trichlorofluoromethane are increasing in TW-99A. These results are considered cursory due to the small sample size. Additional samples will be collected to evaluate whether this is a transient condition due to natural variability in groundwater concentrations, or whether the results are representative of a long-term trend in post-shutdown COC concentrations.

Overall, the groundwater monitoring results show that ACB systems have been effective at reducing COC concentrations. Groundwater sampling will continue to be performed on a quarterly basis to evaluate remedial performance.

4. References

CH2M HILL Engineers, Inc. (CH2M). 2010. Institute 2008 and 2009 *Sevin® Unit, SWMU 1, and SWMUs 2 and 6 Corrective Measures Completion Report, UCC Institute Facility, West Virginia*. May.

CH2M HILL Engineers, Inc. (CH2M). 2018a. *Corrective Measures Study, Union Carbide Corporation Institute Facility, Institute, West Virginia*. May.

CH2M HILL Engineers, Inc. (CH2M). 2018b. *Program Quality Assurance Project Plan, West Virginia Operations, Union Carbide Corporation, South Charleston, West Virginia*. April.

Gilbert, R.O. 1987. *Statistical Methods for Environmental Pollution Monitoring*. Wiley, New York.

Jacobs Engineering Group Inc. (Jacobs). 2019a. *Sitewide Groundwater Performance Monitoring Plan*. Union Carbide Corporation Institute Facility. May.

Jacobs Engineering Group Inc. (Jacobs). 2019b. *Corrective Measures Implementation Work Plan*. Union Carbide Corporation Institute Facility. September.

Jacobs Engineering Group Inc. (Jacobs). 2021. *2020 Groundwater Performance Monitoring Report*. Union Carbide Corporation Institute Facility. June.

Kaplan, E.L. and O. Meier. 1958. *Nonparametric Estimation from Incomplete Observations*. Journal of the American Statistical Association, 53, 457-481.

U.S. Environmental Protection Agency (USEPA). 1998. *Monitoring and Assessment of In Situ Biocontainment of Petroleum Contaminated Ground-Water Plumes*. EPA/600/R 98/020. Office of Research and Development, Washington DC. February.

U.S. Environmental Protection Agency (EPA). 2009. *Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities: Unified Guidance*. EPA-530-R-09-007. Office of Resource Conservation and Recovery, U.S. Environmental Protection Agency. March.

U.S. Environmental Protection Agency (USEPA). 2018. *Final Decision and Response to Comments, Union Carbide Corporation – Institute Operations (Formerly Bayer CropScience LP)*. October 24.

Tables

Table 1. Runtime Summary for Subarea 3D*2020 Operation, Maintenance, and Monitoring Activities Memorandum**UCC Institute Facility, Institute, West Virginia*

Period	Monthly Runtime	Notes
January-20	99%	GW Sampling
February-20	63%	GW Sampling
March-20	100%	
April-20	100%	
May-20	100%	
June-20	86%	GW Sampling
July-20	100%	
August-20	53%	GW Sampling/PRV recertification
September-20	29%	PRV recertification/GW Sampling
October-20	100%	
November-20	100%	
December-20	55%	GW Sampling

Notes:

% = percent

GW = groundwater

PRV = pressure relief valve

UCC = Union Carbide Corporation

Table 2. Monitoring Well Construction*2020 Operation, Maintenance, and Monitoring Activities Memorandum**UCC Institute Facility, Institute, West Virginia*

Monitoring Well	Total Depth at Installation (ft btoc)	Well Diameter (inches)	Screen Length (ft)	Screen Depth (ft bgs)	Screen Slot Size (inches)
Area 3A					
TW-127A	30.0	2	10	20-30	0.01
TW-117A	34.0	2	10	24-34	0.01
TW-116A	30.0	2	10	20-30	0.01
TW-114A	30.0	2	10	20-30	0.01
TW-118A	30.0	2	10	20-30	0.01
TW-120A	33.0	2	10	23-33	0.01
TW-119A	30.0	2	10	20-30	0.01
TW-115A	30.0	2	10	20-30	0.01
Area 3B					
TW-51	29.0	2	2	19-29	0.01
TW-95B	50.0	2	10	40-50	0.01
TW-100B	42.0	2	10	32-42	0.01
TW-97B	45.0	2	10	35-45	0.01
TW-98B	45.0	2	10	35-45	0.01
TW-96B	42.0	2	10	32-42	0.01
TW-101B	43.0	2	10	33-43	0.01
TW-99A	45.0	2	10	35-45	0.01
Area 3C					
TW-124B	45.0	2	10	35-45	0.01
TW-125B	45.0	2	10	35-45	0.01
TW-122B	45.0	2	10	35-45	0.01
TW-126B	45.0	2	10	35-45	0.01
TW-121A	30.0	2	10	20-30	0.01
TW-123B	45.0	2	10	35-45	0.01
Area 3D					
TW-88A	30.0	2	10	20-30	0.01
TW-87A	30.0	2	10	20-30	0.01
TW-86A	30.0	2	10	20-30	0.01
TW-94B	45.0	2	10	35-45	0.01
TW-89A	35.0	2	10	25-35	0.01
TW-90B	45.0	2	10	35-45	0.01
TW-91B	50.0	2	10	40-50	0.01
TW-93B	44.0	2	10	34-44	0.01
TW-92B	50.0	2	10	30-50	0.01

Notes:

ft = feet

ft bgs = feet below ground surface

ft btoc = feet below top of casing

TOC = top of casing

UCC = Union Carbide Corporation

Table 3. Groundwater Elevation*2020 Operation, Maintenance, and Monitoring Activities Memorandum**UCC Institute Facility, Institute, West Virginia*

Monitoring Well	Date	Total Depth at Installation (ft btoc)	Measured Total Depth (ft btoc)	Depth to GW (ft btoc)	TOC Elevation (ft amsl)	GW Elevation (ft amsl)
Area 3A						
TW-127A	2/10/2020	30.0	32.50	21.43	602.91	581.48
	6/23/2020		NM	NM		NM
	8/25/2020		NM	NM		NM
	12/5/2020		32.55	21.12		581.79
TW-117A	2/10/2020	34.0	33.05	21.27	602.80	581.53
	6/22/2020		33.00	19.69		583.11
	8/25/2020		33.01	20.18		582.62
	12/8/2020		32.98	21.01		581.79
TW-116A	2/10/2020	30.0	32.80	21.44	603.05	581.61
	6/22/2020		32.85	19.95		583.10
	8/25/2020		32.94	20.41		582.64
	12/5/2020		32.82	21.20		581.85
TW-114A	2/10/2020	30.0	29.40	17.57	599.22	581.65
	6/23/2020		29.40	16.00		583.22
	8/26/2020		29.45	16.60		582.62
	12/7/2020		29.99	17.35		581.87
TW-118A	2/11/2020	30.0	29.50	17.49	599.10	581.61
	6/22/2020		29.70	15.90		583.20
	8/28/2020		29.30	16.49		582.61
	12/9/2020		29.99	17.09		582.01
TW-120A	2/11/2020	33.0	32.96	21.49	603.12	581.63
	6/23/2020		32.95	20.00		583.12
	8/25/2020		32.95	20.43		582.69
	12/7/2020		33.90	21.19		581.93
TW-119A	2/11/2020	30.0	28.98	18.55	603.53	584.98
	6/22/2020		NM	18.16		585.37
	8/25/2020		28.85	17.71		585.82
	12/8/2020		29.59	18.37		585.16
TW-115A	2/11/2020	30.0	33.00	21.90	599.36	577.46
	6/23/2020		33.01	20.35		579.01
	8/25/2020		33.00	20.80		578.56
	12/8/2020		31.01	21.85		577.51
Area 3B						
TW-51	2/6/2020	30.0	29.20	17.55	598.69	581.14
	6/18/2020		29.20	15.65		583.04
	8/25/2020		29.29	16.06		582.63
	12/5/2020		29.43	17.19		581.50

Table 3. Groundwater Elevation*2020 Operation, Maintenance, and Monitoring Activities Memorandum**UCC Institute Facility, Institute, West Virginia*

Monitoring Well	Date	Total Depth at Installation (ft btoc)	Measured Total Depth (ft btoc)	Depth to GW (ft btoc)	TOC Elevation (ft amsl)	GW Elevation (ft amsl)
TW-95B	2/7/2020	50.0	49.80	18.20	598.88	580.68
	6/18/2020		50.20	15.85		583.03
	8/21/2020		49.70	16.18		582.70
	12/5/2020		50.65	17.19		581.69
TW-100B	2/7/2020	42.0	41.95	21.50	601.52	580.02
	6/18/2020		41.91	19.09		582.43
	8/21/2020		41.90	19.62		581.90
	12/4/2020		41.90	20.80		580.72
TW-97B	2/8/2020	45.0	44.56	17.19	599.71	582.52
	6/19/2020		44.50	17.81		581.90
	8/24/2020		44.50	16.98		582.73
	12/7/2020		45.05	18.28		581.43
TW-98B	2/8/2020	45.0	44.93	18.30	599.77	581.47
	6/19/2020		44.91	16.71		583.06
	8/24/2020		44.88	17.05		582.72
	12/4/2020		44.88	18.14		581.63
TW-96B	2/7/2020	42.0	41.65	18.20	599.66	581.46
	6/19/2020		41.65	16.62		583.04
	8/24/2020		41.60	17.07		582.59
	12/4/2020		41.64	17.96		581.70
TW-101B	2/8/2020	43.0	43.15	17.93	599.37	581.44
	6/19/2020		43.09	16.35		583.02
	8/20/2020		43.06	16.62		582.75
	12/4/2020		43.07	17.39		581.98
TW-99A	2/8/2020	45.0	44.21	18.70	600.19	581.49
	6/19/2020		NM	NM		NM
	8/21/2020		44.16	19.50		580.69
	12/5/2020		44.19	18.50		581.69
Area 3C						
TW-124B	2/3/2020	45.0	48.23	20.20	601.86	581.66
	6/15/2020		48.22	18.82		583.04
	8/18/2020		49.80	19.14		582.72
	12/3/2020		48.21	19.82		582.04
TW-125B	2/5/2020	45.0	44.77	16.77	598.46	581.69
	6/15/2020		44.78	15.20		583.26
	8/18/2020		44.73	15.73		582.73
	12/3/2020		44.81	16.45		582.01

Table 3. Groundwater Elevation*2020 Operation, Maintenance, and Monitoring Activities Memorandum**UCC Institute Facility, Institute, West Virginia*

Monitoring Well	Date	Total Depth at Installation (ft btoc)	Measured Total Depth (ft btoc)	Depth to GW (ft btoc)	TOC Elevation (ft amsl)	GW Elevation (ft amsl)
TW-122B	2/3/2020	45.0	47.82	19.91	601.64	581.73
	6/15/2020		NM	NM		NM
	8/18/2020		47.91	18.96		582.68
	12/3/2020		48.69	19.63		582.01
TW-126B	2/4/2020	45.0	47.93	20.05	601.80	581.75
	6/15/2020		48.98	18.71		583.09
	8/18/2020		48.51	19.10		582.70
	12/3/2020		48.70	19.79		582.01
TW-121A	2/4/2020	30.0	32.93	20.28	602.01	581.73
	6/15/2020		33.04	18.96		583.05
	8/18/2020		33.09	19.39		582.62
	12/3/2020		33.40	19.96		582.05
TW-123B	2/4/2020	45.0	44.57	16.66	598.40	581.74
	6/15/2020		44.59	15.41		582.99
	8/18/2020		44.56	15.60		582.80
	12/3/2020		44.52	16.37		582.03
Area 3D						
TW-88A	2/4/2020	30.0	29.70	16.81	598.49	581.68
	6/16/2020		29.71	15.78		582.71
	9/1/2020		29.65	15.70		582.79
	12/10/2020		29.65	16.61		581.88
TW-87A	2/5/2020	30.0	30.07	17.00	598.39	581.39
	6/17/2020		30.07	15.62		582.77
	8/19/2020		30.08	15.91		582.48
	12/11/2020		30.19	16.79		581.60
TW-86A	2/5/2020	30.0	29.82	16.81	598.44	581.63
	6/16/2020		29.79	15.62		582.82
	8/19/2020		29.99	15.76		582.68
	12/10/2020		30.00	13.00		585.44
TW-94B	2/5/2020	45.0	43.90	17.37	599.08	581.71
	6/17/2020		43.91	16.01		583.07
	8/20/2020		43.90	16.25		582.83
	12/11/2020		44.59	17.10		581.98
TW-89A	2/5/2020	35.0	35.88	17.81	598.26	580.45
	6/17/2020		33.82	17.48		580.78
	8/28/2020		35.89	16.75		581.51
	12/15/2020		36.01	17.59		580.67
TW-90B	2/6/2020	45.0	44.61	16.56	598.31	581.75
	6/16/2020		44.60	15.59		582.72
	9/1/2020		44.59	15.63		582.68
	12/9/2020		44.91	16.44		581.87

Table 3. Groundwater Elevation*2020 Operation, Maintenance, and Monitoring Activities Memorandum**UCC Institute Facility, Institute, West Virginia*

Monitoring Well	Date	Total Depth at Installation (ft btoc)	Measured Total Depth (ft btoc)	Depth to GW (ft btoc)	TOC Elevation (ft amsl)	GW Elevation (ft amsl)
TW-91B	2/6/2020	50.0	50.08	16.50	598.19	581.69
	6/16/2020		50.05	15.19		583.00
	8/28/2020		50.01	15.49		582.70
	12/15/2020		50.21	16.35		581.84
TW-93B	2/5/2020	44.0	43.20	17.48	599.01	581.53
	6/16/2020		43.15	14.81		584.20
	8/20/2020		43.29	16.42		582.59
	12/15/2020		43.45	17.25		581.76
TW-92B	2/6/2020	50.0	48.55	15.72	597.49	581.77
	6/16/2020		46.81	14.86		582.63
	8/19/2020		48.35	14.90		582.59
	12/4/2020		49.22	15.59		581.90

Notes:

ft amsl = feet above mean sea level

ft btoc = feet below top of casing

GW = groundwater

NM = not measured

TOC = top of casing

UCC = Union Carbide Corporation

Table 4. Groundwater Water Quality Parameters

2020 Operation, Maintenance, and Monitoring Activities Memorandum

UCC Institute Facility, Institute, West Virginia

Monitoring Well	Sample Date	Depth to water (feet)	pH (standard units)	Temperature (degrees Celsius)	Conductivity (mS/cm)	Oxidation Reduction Potential (mV)	Dissolved Oxygen (mg/L)	Turbidity (NTU)
Area 3A								
TW-114A	2/10/2020	17.57	6.18	17.3	0.415	115.0	8.64	346.00
	6/23/2020	16.00	5.19	18.4	0.520	137.3	9.80	57.00
	8/26/2020	16.6	5.54	20.7	0.580	218	4.57	87.40
	12/7/2020	17.35	6.52	16.3	0.392	242.9	5.1	5.19
TW-115A	2/11/2020	21.90	6.11	15.5	0.770	91.6	1.45	17.80
	6/23/2020	20.35	5.32	18.5	0.620	93.2	NS	NS
	8/25/2020	20.8	5.99	19.1	0.850	80	0.54	11.52
	12/8/2020	21.85	5.99	13.8	0.750	137.7	0.63	109.00
TW-116A	2/10/2020	21.44	6.68	15.7	0.730	-130.2	0.67	58.50
	6/22/2020	19.95	6.59	21.8	0.870	-138.3	0.80	29.20
	8/25/2020	20.41	6.44	21.6	0.660	-103.7	1.4	10.60
	12/5/2020	21.2	6.70	16.6	0.590	-69.9	0.37	4.63
TW-117A	2/10/2020	21.27	5.56	13.5	0.458	292.4	4.15	20.00
	6/22/2020	19.69	5.29	25.6	0.444	108.4	1.80	10.00
	8/25/2020	20.18	5.45	19.9	0.457	251.9	1.25	28.30
	12/8/2020	21.01	5.54	12.3	0.408	168.3	0.89	11.80
TW-118A	2/11/2020	17.49	10.06	17.8	0.224	18.8	7.73	218.00
	6/22/2020	15.90	9.01	18.6	0.331	81.5	1.80	22.60
	8/28/2020	16.49	9.10	18.3	0.394	64.5	7.43	1000.00
	12/9/2020	17.09	9.17	17.8	0.389	133.2	2.25	81.30
TW-119A	2/11/2020	17.71	8.19	13.5	0.118	149.2	8.83	68.80
	6/22/2020	NS	NS	NS	NS	NS	nn	NS
	8/25/2020	16.61	6.90	18.8	0.670	42	0.31	23.40
	12/8/2020	17.62	6.89	13.1	0.377	133.1	0.51	632.00
TW-120A	2/11/2020	21.49	6.06	14.5	0.530	228.2	8.90	21.20
	6/23/2020	20.00	5.34	20.6	0.406	122.8	4.80	92.70
	8/25/2020	20.43	6.13	20.1	0.510	211.3	9.31	38.80
	12/7/2020	21.19	6.06	14.4	0.600	245	5.9	91.20
TW-127A	2/10/2020	21.43	5.97	17.1	0.360	246.6	7.74	47.20
	6/23/2020	NS	NS	NS	NS	NS	NS	NS
	8/25/2020	NS	NS	NS	NS	NS	NS	NS
	12/5/2020	21.12	5.93	17.4	0.385	205.3	5.04	9.33

Table 4. Groundwater Water Quality Parameters

2020 Operation, Maintenance, and Monitoring Activities Memorandum

UCC Institute Facility, Institute, West Virginia

Monitoring Well	Sample Date	Depth to water (feet)	pH (standard units)	Temperature (degrees Celsius)	Conductivity (mS/cm)	Oxidation Reduction Potential (mV)	Dissolved Oxygen (mg/L)	Turbidity (NTU)
Area 3B								
TW-51	2/6/2020	17.55	6.71	17.6	0.295	97.4	4.15	165.00
	6/18/2020	15.65	6.56	18.1	0.650	109.5	2.40	47.50
	8/25/2020	16.06	6.56	19.9	0.550	191.2	3.71	35.40
	12/5/2020	17.19	6.68	17.5	0.550	54.6	1.76	274.00
TW-95B	2/7/2020	18.20	3.52	14.2	0.406	196.5	6.65	51.70
	6/18/2020	15.85	4.95	18.6	0.484	161.8	7.80	21.40
	8/21/2020	16.18	4.86	19	0.470	221.3	6.24	17.10
	12/5/2020	17.19	5.80	16.2	0.370	82	2.24	6.81
TW-96B	2/7/2020	18.20	3.30	17.7	0.600	314.1	1.69	1.87
	6/19/2020	16.62	3.13	20.1	0.640	237.7	1.40	6.16
	8/24/2020	17.07	3.55	20.2	0.580	331.2	1.81	7.64
	12/4/2020	17.96	3.75	17.4	0.440	310.1	0.89	2.48
TW-97B	2/8/2020	18.14	5.32	8.9	0.297	263.2	7.75	8.56
	6/19/2020	16.50	4.55	18.7	0.383	131.1	1.20	9.95
	8/24/2020	17	4.89	20.3	0.407	264.9	5.50	27.50
	12/7/2020	17.42	5.09	15.7	0.373	229.8	1.01	18.80
TW-98B	2/8/2020	18.30	3.52	15.2	0.560	346.5	0.84	5.30
	6/19/2020	16.71	4.29	19.3	0.300	146.2	1.10	3.06
	8/24/2020	17.05	5.18	19	0.281	199.1	0.89	5.83
	12/4/2020	18.14	4.94	16.6	0.271	217.6	0.82	0.76
TW-99A	2/8/2020	18.70	5.17	15.0	0.339	95.6	1.65	3.07
	6/19/2020	NS	NS	NS	NS	NS	NS	NS
	8/21/2020	19.5	5.35	18.5	0.410	69.2	0.95	25.00
	12/5/2020	18.5	5.24	16.5	0.321	152.2	0.85	5.79
TW-100B	2/7/2020	21.5	7.85	14.5	0.119	137.2	7.85	59.50
	6/18/2020	19.09	6.18	18.4	0.386	75.4	1.90	12.60
	8/21/2020	19.62	6.27	18.3	0.273	16.8	1.96	4.30
	12/4/2020	20.8	6.41	16.7	0.292	-11	2.72	2.99
TW-101B	2/8/2020	17.93	3.84	14.4	0.231	413.8	10.00	33.50
	6/19/2020	16.35	3.21	18.4	0.225	236.6	6.80	48.90
	8/20/2020	16.62	3.74	18.7	0.248	393.9	7.79	33.00
	12/4/2020	17.39	4.07	16.2	0.188	405.4	8.66	8.50

Table 4. Groundwater Water Quality Parameters

2020 Operation, Maintenance, and Monitoring Activities Memorandum

UCC Institute Facility, Institute, West Virginia

Monitoring Well	Sample Date	Depth to water (feet)	pH (standard units)	Temperature (degrees Celsius)	Conductivity (mS/cm)	Oxidation Reduction Potential (mV)	Dissolved Oxygen (mg/L)	Turbidity (NTU)
Area 3C								
TW-121A	2/4/2020	20.28	7.71	15.8	0.428	47.8	4.88	94.70
	6/15/2020	18.96	7.36	18.8	0.291	53.1	1.65	51.40
	8/18/2020	19.39	7.43	23.0	0.422	159.1	1.39	41.80
	12/3/2020	19.96	7.47	13.8	0.490	65	1.72	17.70
TW-122B	2/3/2020	19.91	8.77	18.1	0.630	47.0	12.04	199.00
	6/15/2020	NS	NS	NS	NS	NS	NS	NS
	8/18/2020	18.96	8.75	22.2	0.489	173.7	8.61	159.00
	12/3/2020	19.63	9.02	13.9	0.434	89.4	9.01	81.90
TW-123B	2/4/2020	16.66	10.28	17.2	0.850	-3.7	0.54	289.00
	6/15/2020	15.41	9.80	18.3	0.168	20.0	1.09	364.00
	8/18/2020	15.6	10.2	26.1	0.730	-6.3	0.84	200.00
	12/3/2020	16.37	10.11	17.6	0.630	97.5	1.32	189.00
TW-124B	2/3/2020	20.20	9.21	17.9	1.200	53.8	11.05	232.00
	6/15/2020	18.82	8.84	21.0	0.810	53.2	2.93	170.00
	8/18/2020	19.14	9.53	22.5	0.880	105.1	0.24	170.00
	12/3/2020	19.82	9.3	17.7	0.630	123.2	1.51	198.00
TW-125B	2/5/2020	16.77	8.80	17.9	1.480	51.3	9.76	214.00
	6/15/2020	15.20	8.90	17.1	1.120	66.3	5.95	216.00
	8/18/2020	15.73	9.32	19.7	0.970	34.8	6.24	148.00
	12/3/2020	16.45	9.02	16.8	0.630	157.3	9.15	81.10
TW-126B	2/4/2020	20.05	9.23	16.7	0.560	12.1	5.34	31.90
	6/15/2020	18.71	8.80	20.4	0.548	35.2	1.06	29.40
	8/18/2020	19.10	8.8	26.5	0.491	0.9	1.93	59.10
	12/3/2020	19.79	9.48	16.2	0.399	117.2	2.20	20.90

Table 4. Groundwater Water Quality Parameters

2020 Operation, Maintenance, and Monitoring Activities Memorandum

UCC Institute Facility, Institute, West Virginia

Monitoring Well	Sample Date	Depth to water (feet)	pH (standard units)	Temperature (degrees Celsius)	Conductivity (mS/cm)	Oxidation Reduction Potential (mV)	Dissolved Oxygen (mg/L)	Turbidity (NTU)
Area 3D								
TW-86A	2/5/2020	16.81	8.43	13.3	0.105	41.5	10.28	66.50
	6/16/2020	15.62	7.55	17.7	0.189	85.4	9.21	28.40
	8/19/2020	15.76	7.72	21.4	0.187	213.7	3.59	11.20
	12/10/2020	13	8.24	17.9	0.197	161.1	5.24	78.50
TW-87A	2/5/2020	17.00	5.78	11.1	0.158	121.5	11.24	63.40
	6/17/2020	15.62	6.14	18.6	0.193	182.0	10.79	60.20
	8/19/2020	15.91	5.79	22.2	0.178	211	9.64	98.00
	12/11/2020	16.79	7.02	16.4	0.192	183.8	7.19	31.20
TW-88A	2/4/2020	16.81	6.32	16.4	0.228	117.2	12.13	19.70
	6/16/2020	15.78	6.26	19.8	0.332	144.3	11.87	30.90
	9/1/2020	15.7	7.03	21.3	0.203	247.4	13.36	29.10
	12/10/2020	16.61	6.99	14.5	0.252	200.1	8.01	65.30
TW-89A	2/5/2020	17.81	3.16	16.4	0.770	374.8	3.44	49.70
	6/17/2020	17.48	3.37	17.3	0.92	377	3.95	25.90
	8/28/2020	16.75	3.29	18.3	0.98	394.5	3.12	69.60
	12/15/2020	17.59	0.324	16.8	0.75	319.3	2.81	16.90
TW-90B	2/6/2020	16.56	6.75	11.4	0.252	192.4	12.56	194.00
	6/16/2020	15.59	6.36	24.0	0.320	110.2	13.37	183.00
	9/1/2020	15.63	6.72	20.6	0.495	210.9	10.81	366.00
	12/9/2020	16.44	6.73	12.2	0.299	173.5	1.01	410.00
TW-91B	2/6/2020	16.50	6.37	9.5	0.498	134.6	10.40	312.00
	6/16/2020	15.19	6.61	19.6	0.720	119.8	6.90	408.00
	8/28/2020	15.49	6.41	19.3	0.64	149.3	10.13	260.00
	12/15/2020	16.35	6.13	14.6	0.315	163	9.88	198.00
TW-92B	2/6/2020	15.72	6.83	15.5	0.469	166.4	11.04	237.00
	6/16/2020	14.86	6.48	16.7	0.295	69.4	1.54	32.10
	8/19/2020	14.9	7.02	18.1	0.99	217.4	15.3	396.00
	12/4/2020	15.59	7.33	15.9	0.78	170.5	8.98	276.00
TW-93B	2/5/2020	17.48	5.89	15.3	0.398	117.1	4.34	106.30
	6/16/2020	14.81	6.95	18.3	0.600	92.9	15.70	316.00
	8/20/2020	16.42	5.83	19.5	0.325	249.6	10.3	76.70
	12/15/2020	17.25	6.18	10.3	0.257	163.3	11.1	45.10

Table 4. Groundwater Water Quality Parameters*2020 Operation, Maintenance, and Monitoring Activities Memorandum**UCC Institute Facility, Institute, West Virginia*

Monitoring Well	Sample Date	Depth to water (feet)	pH (standard units)	Temperature (degrees Celsius)	Conductivity (mS/cm)	Oxidation Reduction Potential (mV)	Dissolved Oxygen (mg/L)	Turbidity (NTU)
TW-94B	2/5/2020	17.37	9.41	14.4	0.960	-69.9	2.61	206.00
	6/17/2020	16.01	10.18	18.1	1.160	20.2	1.21	79.60
	8/20/2020	16.25	9.69	21.2	1.22	-148.6	0.5	41.70
	12/11/2020	17.1	9.66	18.8	1.04	63.2	0.1	1000.00

Notes:

mg/L = milligram(s) per liter

mS/cm = milliseimen(s) per centimeter

mV = millivolt(s)

NS = not sampled

NTU = nephelometric turbidity units

UCC = Union Carbide Corporation

Table 5. Analytical Data for Subarea 3A
2020 Operation, Maintenance, and Monitoring Activities Memorandum
UCC Institute Facility, Institute, West Virginia

	Subarea	Inside 3A TTZ																		
	Location	TW-115A														TW-116A				
	Sample Date	09/19/2016	12/14/2017	04/06/2018	06/29/2018	08/07/2018	11/01/2018	02/14/2019	04/12/2019	07/25/2019	12/10/2019	2/11/2020	6/23/2020	8/25/2020	12/8/2020	12/5/2016	12/14/2017	04/06/2018	06/28/2018	09/14/2018
Contaminant of Concern	Units																			
Carbon tetrachloride	µg/L	22200	10400	4100	9700	9300	5000	4000	3200	2600	1400 J	2400	2000	3500	4700	21600	922	390	730	320
Chloroform	µg/L	14400	8090	3800	7200	8900	5100	4400	3600	3000	2000	3400	2600	4200	4900	7190	753	530	960	780
Tetrachloroethene	µg/L	2710	1080	510	940	850	550	530	290 J	360	320	420	360 J	480	650	1390	154	64	160	91
Trichlorofluoromethane	µg/L	12000	7530	4800	6300	5600	3700	3100	4400	1400	1700 J	2000	2600	3100	3000	20800	776	920	510	200
Total	µg/L	56972.6	32358.1	17783	29540	29382	18370	16150	16265	9330	9840	11562	14998	16980	16710	51925.5	2627.76	1985.8	2519.2	1403.1

Table 5. Analytical Data for Subarea 3A
2020 Operation, Maintenance, and Monitoring Activities Memorandum
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	Subarea	Inside 3A TTZ										Inside 3A TTZ								
	Location	TW-116A									TW-117A									
	Sample Date	10/31/2018	02/14/2019	04/11/2019	07/25/2019	12/10/2019	2/10/2020	6/22/2020	8/25/2020	12/5/2020	12/07/2016	12/07/2016	12/14/2017	04/05/2018	06/28/2018	09/14/2018	10/31/2018	02/14/2019	04/11/2019	
Contaminant of Concern	Units																			
Carbon tetrachloride	µg/L	82 J	94	29	37	6.2 J	8.1	9.3	6.4	12	9940	10400	43.8	24	17	11	11	9.4	9.9	
Chloroform	µg/L	290	500	320	280	110	59	20	20	28	10700	11000	531	360	410	380	540	280	310	
Tetrachloroethene	µg/L	38	64	49	97	68	91	39 J	36	38	2060	2310	33.3	20	21 U	15 U	19 U	14	17	
Trichlorofluoromethane	µg/L	110	150 U	82	170	97 J	32 J	17 J	30	39	7270	7570	41	20	15	13	15	9.9 U	10	
Total	µg/L	528.7	817.16	688	775	424.2	454.4	230.14	159.23	174.48	36442	36882.1	693.1	447.8	493	449	449	332.3	383.8	

Table 5. Analytical Data for Subarea 3A
2020 Operation, Maintenance, and Monitoring Activities Memorandum
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	Subarea	Inside 3A TTZ																			
	Location	TW-117A							TW-118A												
	Sample Date	07/24/2019	12/10/2019	2/10/2020	2/10/2020	6/22/2020	8/25/2020	12/8/2020	12/07/2016	12/14/2017	04/06/2018	06/28/2018	09/14/2018	04/12/2019	07/24/2019	12/16/2019	2/11/2020	6/22/2020	8/25/2020	8/25/2020	12/9/2020
Contaminant of Concern	Units																				
Carbon tetrachloride	µg/L	6.6	4.7 J	14	11	19 J	37 J	80	526	93.2	34	50 U	24	13	8.6	8.8	4.1	7.5	3.9	3.8	7
Chloroform	µg/L	230	170	150	150	76 J	110	140	7740	2850 L	2700	2800	1700	1000	700	340 J	130	210 J	56	55	46
Tetrachloroethene	µg/L	11	8.4	15	12	13 J	23	36	1200	394	250	270 J	240	140	120	120	56	87 J	55	56	76
Trichlorofluoromethane	µg/L	11	4 J	11 J	11 J	14 J	24 J	27	17800	5150	5700	3600	1300 J	1700	960	760 J	220 J	310 J	91	80	65
Total	µg/L	279.6	198.1	204.6	196	132.1	207.02	299	37481	11405.1	12192	3172	4353.2	3567	2099.4	1291.7	485.5	886.02	258.15	245.62	211.01

Table 5. Analytical Data for Subarea 3A
2020 Operation, Maintenance, and Monitoring Activities Memorandum
UCC Institute Facility, Institute, West Virginia

	Subarea	Inside 3A TTZ														Outside 3A TTZ			
	Location	TW-120A														TW-114A (SIDE)			
	Sample Date	9/19/2016	12/13/2017	4/6/2018	6/29/2018	8/7/2018	11/1/2018	2/14/2019	4/11/2019	7/24/2019	12/10/2019	2/11/2020	6/23/2020	8/25/2020	12/7/2020	12/5/2016	12/14/2017	4/5/2018	6/28/2018
Contaminant of Concern	Units																		
Carbon tetrachloride	µg/L	10800	7070	2100	2300	2000	3000	1700	930	740	350 J	920	540 J	650 J	1300	1140	134	34	24
Chloroform	µg/L	14000	9100	4300	5300	9900	8800	4800	3200	3000	1400	3700	1600 J	1600 J	2400	739	174	85	72
Tetrachloroethene	µg/L	174	111	44	100 U	100 U	100 U	100 U	25	23 J	20	36	19 J	20	47	174	20 U	4.6 U	3.1 U
Trichlorofluoromethane	µg/L	20900	22500	21000	13000	14000	8700	6100	4200	2200	1000 J	1700 J	1300 J	1500 J	990	9250	2090	260	170
Total	µg/L	46154.9	38858.9	27467	20600	25900	20500	12600	8379.1	5963	2770	6362.3	3464.23	3770	4737	12311	2398	384.1	270.9

Table 5. Analytical Data for Subarea 3A
2020 Operation, Maintenance, and Monitoring Activities Memorandum
UCC Institute Facility, Institute, West Virginia

	Subarea	Outside 3A TTZ																	
	Location	TW-114A (SIDE)										TW-119A (UP)							
	Sample Date	9/14/2018	10/31/2018	2/13/2019	4/11/2019	8/2/2019	12/16/2019	2/10/2020	6/23/2020	8/26/2020	12/7/2020	9/19/2016	12/13/2017	4/6/2018	6/29/2018	9/17/2018	11/1/2018	2/13/2019	4/11/2019
Contaminant of Concern	Units																		
Carbon tetrachloride	µg/L	12	15	46	46	13	24	100	41 J	32 J	59	182	30.1	50 U	50 U	50	68	130	130
Chloroform	µg/L	65	73	75	69	54	11	69	40 J	34	37	969	821	960	5700	16000	12000	3200	3000
Tetrachloroethene	µg/L	2.5 U	2.7 U	3.8	3.9	2.5	1.8	8.3	6.9	10 U	11	76.3 B	27.4 B	50 U	50 U	50 U	50 U	50 U	25 U
Trichlorofluoromethane	µg/L	71 U	88	290	400	120	480 J	1200 J	220 J	140 J	180	2890	4260	3400	4700	5700	5800	5900	4400
Total	µg/L	82	181.1	419	523	194.1	517.4	1393.2	310.38	206	287	7377.6	12250.2	13410	17760	27050	22018	15550	12120

Table 5. Analytical Data for Subarea 3A
2020 Operation, Maintenance, and Monitoring Activities Memorandum
UCC Institute Facility, Institute, West Virginia

	Subarea	Outside 3A TTZ																		
	Location	TW-119A (UP)						TW-127A (DOWN)												
	Sample Date	7/25/2019	12/10/2019	2/11/2020	6/22/2020	8/25/2020	12/8/2020	12/6/2016	12/14/2017	6/28/2018	9/14/2018	10/31/2018	2/14/2019	4/11/2019	7/24/2019	12/10/2019	2/10/2020	6/22/2020	8/25/2020	12/5/2020
Contaminant of Concern	Units																			
Carbon tetrachloride	µg/L	150	71 J	1.4	85	61	28	15900	222	73	110 J	35 J	57	30	29 J	35	41	38 J	56	72
Chloroform	µg/L	3100	1400	120	510	330	240	5810	287	150	130 J	84 J	68	62	65 J	76	53	52 J	55	53
Tetrachloroethene	µg/L	50 U	25 U	6.4	35	47	18	715	64.2	29	31 J	16	21	17 J	12 J	14 J	16 J	10 J	14	14 J
Trichlorofluoromethane	µg/L	3800	2500 J	7.4 J	1900	670	330	30700	333	190	130 J	61 J	60	67	44 J	48 J	48	42 J	49	65
Total	µg/L	9960	7281	135.2	3734.9	1587	788	57005.6	1066.12	484.3	435.1	219.5	226.1	196.3	167.3	193	173.3	157.79	193.9	217.5

Table 5. Analytical Data for Subarea 3A
2020 Operation, Maintenance, and Monitoring Activities Memorandum
UCC Institute Facility, Institute, West Virginia

Notes:

µg/L = microgram(s) per liter

B = analyte reported in blank at similar concentrations

DOWN = location is downgradient from TTZ

J = results are estimated.

SIDE = location is side-gradient to TTZ

TTZ = target treatment zone

U = The analyte was analyzed for, but was not detected above the reported sample quantitation limit.

UCC = Union Carbide Corporation

UP = location is upgradient to TTZ

Table 6. Analytical Data for Subarea 3B
2020 Operation, Maintenance, and Monitoring Activities Memorandum
UCC Institute Facility, Institute, West Virginia

	Subarea	Inside 3B TTZ											
	Location	TW-51											
	Sample Date	4/10/2008	02/11/2016	05/03/2016	09/14/2016	02/02/2017	05/08/2017	08/15/2017	12/18/2017	04/05/2018	06/26/2018	09/14/2018	10/31/2018
Contaminant of Concern	Units												
Carbon tetrachloride	µg/L	71.4	170	62.9	35	30.1	19.7	24.2	7.79	15	13	7.6	11
Chloroform	µg/L	80.4	94.2	73	52.2	50.3 B	37.2	40.7	20.9 B	28	29	20	24
Tetrachloroethene	µg/L	370	396	202	156	197	156	137	104	99	100	79	100 U
Trichlorofluoromethane	µg/L	--	3630	1760	1220	1130	556	815	321	340	300 J	150	320
Total	µg/L	522.26	4290.2	2097.9	1463.2	1407.4	768.9	1016.9	20.9	483.6	442	256.6	455

Table 6. Analytical Data for Subarea 3B
2020 Operation, Maintenance, and Monitoring Activities Memorandum
UCC Institute Facility, Institute, West Virginia

	Subarea	Inside 3B TTZ															
	Location	TW-51								TW-98B							
	Sample Date	02/12/2019	04/10/2019	07/23/2019	12/06/2019	2/6/2020	6/18/2020	8/25/2020	12/5/2020	10/27/2015	02/15/2016	05/02/2016	09/14/2016	02/02/2017	05/05/2017	08/14/2017	12/19/2017
Contaminant of Concern	Units																
Carbon tetrachloride	µg/L	13	8.5	18	17	9.3	8.8	7.8	8.4	2 K	5 U	5 U	5 U	5 U	1 U	2.5 U	2.5 U
Chloroform	µg/L	26	22	21	23	17	16	16	15	2	340	152	86.2	54.1 B	76.1	62.6	54.8
Tetrachloroethene	µg/L	120	110	130	120	68	46	39	54	2 B	5 U	5 U	5 U	5 U	1 U	2.5 U	2.5 U
Trichlorofluoromethane	µg/L	490	240	400 J	600 J	210	100	65	160	2 J	1580	926	810	513	328	405	313
Total	µg/L	649	380.5	574.9	766.6	304.3	171.35	128.77	237.4	2	2148.3	1093.18	906.2	577.1	408.64	476.61	376.83

Table 6. Analytical Data for Subarea 3B
2020 Operation, Maintenance, and Monitoring Activities Memorandum
UCC Institute Facility, Institute, West Virginia

	Subarea	Inside 3B TTZ															
	Location	TW-98B												TW-99A			
	Sample Date	04/04/2018	06/26/2018	09/13/2018	10/31/2018	02/12/2019	04/09/2019	07/22/2019	12/05/2019	2/8/2020	6/19/2020	8/24/2020	12/4/2020	10/27/2015	02/10/2016	05/02/2016	09/14/2016
Contaminant of Concern	Units																
Carbon tetrachloride	µg/L	0.5 U	5 U	5 U	5 U	1 U	0.5 U	0.5 UJ	0.5 U	0.5 U	0.5 U	50 UJ	50 U	10 K	1 U	2 U	1 U
Chloroform	µg/L	85	90	77	89	88	61	81	150	96	110 J	99 J	74	634	89.1	72.4	43.3 L
Tetrachloroethene	µg/L	0.5 U	5 U	5 U	5 U	1 U	0.5 U	0.5 UJ	0.5 U	0.5 U	0.5 U	50 UJ	50 U	10.3 B	1 U	2 U	1 U
Trichlorofluoromethane	µg/L	490	320 J	320	320	400	210	3400	4800 J	14000 J	10000 J	14000 J	16000	38300 J	398	304	182
Total	µg/L	581.9	420	407	419	493.2	274.2	3492.1	4975.8	14154	10159.98	14099	16074	41279.64	608.14	543.9	245.91

Table 6. Analytical Data for Subarea 3B
2020 Operation, Maintenance, and Monitoring Activities Memorandum
UCC Institute Facility, Institute, West Virginia

	Subarea	Inside 3B TTZ															
	Location	TW-99A															
	Sample Date	02/02/2017	05/05/2017	08/14/2017	12/18/2017	04/04/2018	06/26/2018	09/13/2018	10/31/2018	02/11/2019	04/09/2019	07/17/2019	12/05/2019	2/8/2020	6/22/2020	9/4/2020	12/5/2020
Contaminant of Concern	Units																
Carbon tetrachloride	µg/L	1 U	1 U	10 U	1 U	0.5 U	0.5 U	1 U	1 U	1 U	0.5 U	0.5 UJ	0.5 U	1 U	0.5 U	100 U	100 U
Chloroform	µg/L	28.5 B	33.2	36.5 B	31.3	34	31	36	37	30	26	48	90	130	69 J	170	230
Tetrachloroethene	µg/L	1 U	1 U	10 U	1 U	0.5 U	0.5 U	1 U	1 U	1 U	0.5 U	0.5 UJ	0.5 U	1 U	0.5 U	100 U	100 U
Trichlorofluoromethane	µg/L	95	206	161	173	260	130 J	140	160	110 J	100	2100	8300 J	19000 J	3800 J	21000	21000
Total	µg/L	133.63	420.5	233	224.21	322.1	177.1	192.3	210.9	156.4	145.9	2185	8505.6	19310.5	3970.89	21170	21350

Table 6. Analytical Data for Subarea 3B
2020 Operation, Maintenance, and Monitoring Activities Memorandum
UCC Institute Facility, Institute, West Virginia

	Subarea	Outside 3B TTZ													
	Location	TW-95B (DOWN)													
	Sample Date	10/26/2015	02/15/2016	05/03/2016	09/15/2016	09/15/2016	02/02/2017	02/02/2017	05/08/2017	05/08/2017	08/15/2017	12/19/2017	04/04/2018	06/26/2018	09/14/2018
Contaminant of Concern	Units														
Carbon tetrachloride	µg/L	25 U	25 U	25 U	25 U	25 U	10 U	10 U	20 U	20 U	25 U	10 U	0.5 U	10 U	10 U
Chloroform	µg/L	819	1190	1120	670	729	780	797	826	805	877	534	490	450	420
Tetrachloroethene	µg/L	25 U	25 U	25 U	25 U	25 U	10 U	10 U	20 U	20 U	25 U	10 U	0.6 U	10 U	10 U
Trichlorofluoromethane	µg/L	30900 J	5030	5060	2870	3240	2250	2330	5120	5250	4860	2060	3500	2000 J	1600
Total	µg/L	32370.4	6364.7	6230	3635.9	4074.2	3087.7	3185.5	6078.4	6183.5	5896	2652.4	4037.1	2501	2057

Table 6. Analytical Data for Subarea 3B
2020 Operation, Maintenance, and Monitoring Activities Memorandum
UCC Institute Facility, Institute, West Virginia

	Subarea	Outside 3B TTZ																
	Location	TW-95B (DOWN)									INS-TW96B (DOWN)							
	Sample Date	11/01/2018	02/11/2019	04/09/2019	07/22/2019	12/06/2019	2/7/2020	6/18/2020	9/3/2020	12/5/2020	10/26/2015	02/15/2016	05/03/2016	09/14/2016	02/02/2017	05/09/2017	08/16/2017	12/19/2017
Contaminant of Concern	Units																	
Carbon tetrachloride	µg/L	10 U	10 U	0.5 U	0.5 UJ	0.5 U	5 U	0.5 U	5 U	5 U	11.1	200 U	200 U	200 U	100 U	100 U	100 U	50 U
Chloroform	µg/L	370	410	370	170	260	230	180	180	200	169	200 U	200 U	200 U	127	131 B	113	147
Tetrachloroethene	µg/L	10 U	10 U	0.5 U	0.5 UJ	0.7 U	5 U	0.5 U	5 U	5 U	143	200 U	200 U	200 U	100 U	100 U	100 U	50 U
Trichlorofluoromethane	µg/L	1500	1600 J	1300	1600	1700 J	2800	3400	2500	2300	47000 J	38600	33500	24200	11800	13800	12100	8710
Total	µg/L	1906	2064	1707.6	1793.3	2003.4	3053	3634.02	2728.3	2551.1	47724.29	39612	34530	25162	12330	14390	12521	9137

Table 6. Analytical Data for Subarea 3B
2020 Operation, Maintenance, and Monitoring Activities Memorandum
UCC Institute Facility, Institute, West Virginia

	Subarea	Outside 3B TTZ															
	Location	INS-TW96B (DOWN)												TW-97B (SIDE)			
	Sample Date	04/05/2018	06/26/2018	09/13/2018	11/01/2018	02/12/2019	04/10/2019	07/23/2019	12/06/2019	2/7/2020	6/19/2020	8/24/2020	12/4/2020	10/26/2015	02/10/2016	05/03/2016	09/14/2016
Contaminant of Concern	Units																
Carbon tetrachloride	µg/L	5 U	50 U	50 U	50 U	50 U	0.5 U	0.5 U	0.5 U	50 U	0.5 U	50 U	50 U	348	1080	1190	821
Chloroform	µg/L	130	140	160	160	120	110	95	110	120	76 J	100	96	192 J	2070	2000	1410
Tetrachloroethene	µg/L	5 U	50 U	50 U	50 U	50 U	2.4 U	2.3	10	50 U	7.3	50 U	50 U	6.72 J	100 U	100 U	100 U
Trichlorofluoromethane	µg/L	24000	3200	800	6200	5200	3800 J	4100 J	5000 J	18000 J	4500 J	14000	21000	5420 J	14600	15400	10800
Total	µg/L	24292	9540	8330	6460	5420	3986.2	4254.2	5173.3	18120	4614.21	14100	21096	6014.01	18274	19091	13384

Table 6. Analytical Data for Subarea 3B
2020 Operation, Maintenance, and Monitoring Activities Memorandum
UCC Institute Facility, Institute, West Virginia

	Subarea	Outside 3B TTZ											
	Location	TW-97B (SIDE)											
	Sample Date	02/02/2017	05/08/2017	08/15/2017	08/15/2017	12/19/2017	12/19/2017	04/05/2018	04/05/2018	06/26/2018	06/26/2018	09/13/2018	09/13/2018
Contaminant of Concern	Units												
Carbon tetrachloride	µg/L	658	586	626	611	593	590	380	320	830	810	770	800
Chloroform	µg/L	1110	748	1020	940	678	691 B	380	370	780	720	550	560
Tetrachloroethene	µg/L	50 U	25 U	50 U	10 U	50 U	50 U	25 U	26 U	27 U	28 U	29 U	30 U
Trichlorofluoromethane	µg/L	7670	6840	6160	6160	6170	6280	4400	4400	6700	5200	5100	6000
Total	µg/L	9703	8307	7983	7850	7586.8	7707.3	5214	5115	8414	6828	6509	7460

Table 6. Analytical Data for Subarea 3B
2020 Operation, Maintenance, and Monitoring Activities Memorandum
UCC Institute Facility, Institute, West Virginia

	Subarea	Outside 3B TTZ																
	Location	TW-97B (SIDE)																TW-100B (UP)
	Sample Date	10/31/2018	10/31/2018	02/11/2019	02/11/2019	04/10/2019	04/10/2019	07/22/2019	07/22/2019	12/09/2019	12/09/2019	2/8/2020	6/19/2020	6/19/2020	8/24/2020	12/7/2020	12/7/2020	10/26/2015
Contaminant of Concern	Units																	
Carbon tetrachloride	µg/L	850	850 J	1000	970 E	630	630	730	750	530 J	570	570	500 J	580 J	700	620	650	7.91
Chloroform	µg/L	640	680 J	870	850	400	370	260	260	2180	240	240	290 J	300 J	300	270	270	99
Tetrachloroethene	µg/L	31 U	5 U	25 U	25 U	50 U	50 U	6.9	6.5 U	25 U	13 U	13 U	5.4 J	5.8 U	50 U	50 U	50 U	6.57 B
Trichlorofluoromethane	µg/L	6100	4900 J	7300	7300	3900	3500	4000	4200	3100 J	3200 J	3400 J	2600 J	3500 J	3800	3400	3900	5340
Total	µg/L	7671	6579	9285	9233	4980	4550	5030.9	5274.3	3935	4045	4224	3418.6	4401.2	4800	4290	4820	5977.68

Table 6. Analytical Data for Subarea 3B
2020 Operation, Maintenance, and Monitoring Activities Memorandum
UCC Institute Facility, Institute, West Virginia

	Subarea	Outside 3B TTZ																
	Location	TW-100B (UP)																
	Sample Date	2/10/2016	5/2/2016	9/14/2016	2/2/2017	5/5/2017	8/14/2017	12/19/2017	10/31/2018	4/10/2019	12/5/2019	2/7/2020	6/18/2020	9/4/2020	12/4/2020	10/26/2015	02/10/2016	02/10/2016
Contaminant of Concern	Units																	
Carbon tetrachloride	µg/L	2.5 U	2.5 U	5 U	5 U	5 U	10 U	2.5 U	250 U	0.8 U	1 U	0.5 U	1.7	0.5 U	10 U	25 U	14.2	14.3
Chloroform	µg/L	26.9	43.4	54.5	42.9 B	45.6	50 B	27.2 B	250 U	41 J	22	1.2 U	75	6.1	63	54	44.7	44.4
Tetrachloroethene	µg/L	2.5 U	2.5 U	5 U	5 U	5 U	10 U	2.5 U	250 U	0.5 U	1 U	0.5 U	1.7 U	0.5 U	10 U	25 U	5.25	5.1
Trichlorofluoromethane	µg/L	549	954	1140	731	836	1470	410	71100	550 J	180	22	2000 J	73	1300	2500 J	74500	74600
Total	µg/L	1129.33	1621.41	1703.7	1206.6	1133.9	1639.6	650.64	742.5	267.4	2820	22.6	2342	91.7	1562	98.91	75572.75	75691.2

Table 6. Analytical Data for Subarea 3B
2020 Operation, Maintenance, and Monitoring Activities Memorandum
UCC Institute Facility, Institute, West Virginia

	Subarea	Outside 3B TTZ																	
	Location	TW-101B (SIDE)																	
	Sample Date	05/03/2016	09/14/2016	02/03/2017	05/09/2017	08/16/2017	12/19/2017	04/05/2018	06/27/2018	09/14/2018	11/01/2018	02/13/2019	04/10/2019	07/23/2019	12/06/2019	2/8/2020	6/19/2020	9/4/2020	12/4/2020
Contaminant of Concern	Units																		
Carbon tetrachloride	µg/L	500 U	500 U	250 U	500 U	100 U	250 U	5 U	250 U	250 U	250 U	250 U	5 U	1.1	1.4	5.8	5.8	10 U	10 U
Chloroform	µg/L	500 U	500 U	250 U	500 U	100 U	250 U	53	250 U	250 U	250 U	250 U	41	42	38	25	13	11	12
Tetrachloroethene	µg/L	500 U	500 U	250 U	500 U	100 U	250 U	5 U	250 U	250 U	250 U	250 U	5 U	0.9 U	0.9	2.2	1.6 U	10 U	10 U
Trichlorofluoromethane	µg/L	103000	98100	58000	74600	26600	71100	100000	17000	26000	16000	58000	32000	11000 J	6300 J	3400 J	1600 J	1400	3000
Total	µg/L	105203	100418	59193	76100	27020	72537	100933	17750	26750	16750	58750	32213	11264.2	6565.1	3450.6	1631.5	1411	3012

Table 6. Analytical Data for Subarea 3B
2020 Operation, Maintenance, and Monitoring Activities Memorandum
UCC Institute Facility, Institute, West Virginia

Notes:

µg/L = microgram(s) per liter

B = analyte reported in blank at similar concentrations

DOWN = location is downgradient from TTZ

J = result is estimated

K = result may be estimated high

SIDE = location is side-gradient to TTZ

TTZ = target treatment zone

U = The analyte was analyzed for, but was not detected above the reported sample quantitation limit.

UCC = Union Carbide Corporation

UJ = The analyte was below the reported sample quantitation limit. However, the reported value is approximate

UP = location is upgradient to TTZ

Table 7. Analytical Data for Subarea 3C
2020 Operation, Maintenance, and Monitoring Activities Memorandum
UCC Institute Facility, Institute, West Virginia

	Subarea	Inside 3C TTZ																				
	Location	TW-121A															TW-122B					
	Sample Date	9/19/2016	2/8/2017	5/17/2017	12/10/2017	3/27/2018	6/25/2018	8/7/2018	10/29/2018	2/5/2019	4/4/2019	7/11/2019	12/5/2019	2/4/2020	6/15/2020	9/3/2020	12/3/2020	9/19/2016	2/8/2017	5/17/2017	12/8/2017	3/27/2018
Contaminant of Concern	Units																					
Carbon tetrachloride	µg/L	19100	1360	1280	1760	1300	3200	1300	430	600	550	370	460	620 J	630	460	260	31.8	25 U	25 U	10 U	10 U
Chloroform	µg/L	1760	78.4 B	52.5	56.5	71	110	54	50 U	50 U	23 U	17	26	150	540	410	360	242	108 B	65.1	29.3	15
Tetrachloroethene	µg/L	12000	11700	7920	5630	5900	14000	6800	3800	3300 J	2700	2400	3800	7500	4800	3400	3500	15400	4920	3690	1660	1300
Trichlorofluoromethane	µg/L	11000	758 B	764	603	200	430	180	72	76	55	38	61	170 J	740	930	1600	786	120 B	73	32.6	10 U
Total	µg/L	48319	14051.4	10092.6	8293.5	7471	18511	8334	4842	4042	3305	3134	4347	9150	7318	6683	8092	16830.5	5148	3828.1	1721.9	1315

Table 7. Analytical Data for Subarea 3C
2020 Operation, Maintenance, and Monitoring Activities Memorandum
UCC Institute Facility, Institute, West Virginia

	Subarea	Inside 3C TTZ																				
	Location	TW-122B										TW-124B										
	Sample Date	6/25/2018	9/7/2018	10/29/2018	2/5/2019	4/2/2019	7/11/2019	12/4/2019	2/3/2020	6/15/2020	9/2/2020	12/3/2020	9/19/2016	2/10/2017	5/17/2017	12/10/2017	3/27/2018	6/25/2018	9/7/2018	10/29/2018	2/5/2019	4/2/2019
Contaminant of Concern	Units																					
Carbon tetrachloride	µg/L	10 U	10 U	10 U	25 U	5 U	5 U	2.5 U	5 U	170	300 J	460	10 U	50 U	50 U	10 U	25 U	25 U	25 U	25 U	50 U	10 U
Chloroform	µg/L	18	20	30	25 U	21	20	12	15	32	59 U	80	1630	225 B	176	29.3	100	160	140	90	96	67
Tetrachloroethene	µg/L	1400	1600	1100	1600	1300	1000	540	1400	3200	4800 J	4300	21100	7370	5120	1040	2700	4400	2400	1700	3600 J	2400
Trichlorofluoromethane	µg/L	15	16	21	25 U	11	10	5.3	16	180	550 J	960	9610	1080	562	121	290	460	250	230	210	120
Total	µg/L	1433	1746	1151	1600	1332	1030	557.3	1541	3982	7350	6582	33060.6	8751.8	5911.2	1190.3	3440	5052	3310	2360	3906	2587

Table 7. Analytical Data for Subarea 3C
2020 Operation, Maintenance, and Monitoring Activities Memorandum
UCC Institute Facility, Institute, West Virginia

	Subarea	Outside 3C TTZ																						
	Location	TW-124B						TW-123B (SIDE)																TW-125B (DOWN)
	Sample Date	7/11/2019	12/4/2019	2/3/2020	6/15/2020	9/3/2020	12/3/2020	9/19/2016	2/8/2017	5/17/2017	12/10/2017	3/29/2018	6/25/2018	9/7/2018	10/29/2018	2/5/2019	4/4/2019	7/11/2019	12/5/2019	2/4/2020	6/15/2020	9/3/2020	12/3/2020	9/19/2016
Contaminant of Concern	Units																							
Carbon tetrachloride	µg/L	10 U	2.5 U	10 U	2.5 U	10 U	10 U	10 U	25 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	25 U	25 U	10 U	25 U	25 U	25 U	25 U	10 U
Chloroform	µg/L	76	10	130	18	25 U	21	422	606 B	730	302	750	810	830	950	960	830	880	530	580	360	250	290	3580
Tetrachloroethene	µg/L	2100	350	3600	640	1100	740	5690	6470	7110	7100	6500	8500	8400	8500	6500 J	6100	6600	4700	5900	5300	4500	4400	14400
Trichlorofluoromethane	µg/L	210	43	390 J	94	97	38	1950	1670	2170	924	1300	1500	1500	1100	1100	680	1100	510 J	960	670	300	540	16500
Total	µg/L	2618	437	4540	904.1	1572	853	8402.8	9008.7	10513	8403	9880	13076	14186	11810	9755	8360	9603	6556	8445	7093	5690	5822	35562.4

Table 7. Analytical Data for Subarea 3C
2020 Operation, Maintenance, and Monitoring Activities Memorandum
UCC Institute Facility, Institute, West Virginia

	Subarea	Outside 3C TTZ																	
	Location	TW-125B (DOWN)																	
	Sample Date	2/10/2017	5/17/2017	12/8/2017	12/8/2017	3/27/2018	3/27/2018	6/25/2018	6/25/2018	9/7/2018	9/7/2018	10/29/2018	2/5/2019	4/2/2019	12/4/2019	2/3/2020	6/15/2020	9/3/2020	12/3/2020
Contaminant of Concern	Units																		
Carbon tetrachloride	µg/L	25 U	25 U	10 U	10 U	5 U	5 U	10 U	5 U	5 U	5 U	5 U	5 U	2.5 U	2.5 U	2.5 U	0.35 U	13	15
Chloroform	µg/L	410	480	61.6	58.8	28	29	48	49	42	43	40	14 U	22	13	14	38	44	27
Tetrachloroethene	µg/L	3520	2980	1340	1280	640	700	1100	1200	1200	1300	1000	620	640	510	510	820	730	580
Trichlorofluoromethane	µg/L	1920	1450	181	176	61	62	55	70	53	51	47	23	21	19	17	52	170	80
Total	µg/L	6025.9	4976.9	1592.7	1535.5	729	791	1203	1325.4	1422.5	1501.3	1145	643	685.9	542	541	964	1068.7	764.8

Table 7. Analytical Data for Subarea 3C
2020 Operation, Maintenance, and Monitoring Activities Memorandum
UCC Institute Facility, Institute, West Virginia

	Subarea	Outside 3C TTZ																							
	Location	TW-126B (UP)																							
	Sample Date	9/19/2016	2/10/2017	5/17/2017	12/10/2017	3/27/2018	6/25/2018	9/7/2018	10/29/2018	2/5/2019	2/5/2019	4/4/2019	4/4/2019	7/11/2019	7/11/2019	12/5/2019	12/5/2019	2/4/2020	2/4/2020	6/15/2020	6/15/2020	9/3/2020	9/3/2020	12/3/2020	12/3/2020
Contaminant of Concern	Units																								
Carbon tetrachloride	µg/L	10 U	25 U	25 U	25 U	25 U	25 U	25 U	25 U	50 U	50 U	13 U	13 U	13 U	13 UJ	5 U	5 U	13 U	13 U	12	13	13 U	13 U	13 U	13 U
Chloroform	µg/L	829	1830	1300	703	1100	1300	1200	1200	880	740	1500	1300	800	1000 J	870	770	1100	1100	310	310	490	540	270	260
Tetrachloroethene	µg/L	4100	3860	3480	2850	2900	3500	3500	3400	3400 J	3600 J	4000	3500	3100	3400 J	2300	2500	2700	2800	2800	2800	2900	2900	2600	2600
Trichlorofluoromethane	µg/L	710	1310	1190	515	680	890	720	650	530	490	570	590	450	530 J	380 J	470	840	860	340	370	330	420	260	230
Total	µg/L	5793.5	7143.8	6147.4	4119.3	5107	6750	7295	6303	5410	5470	6667	6017	4856	5457	4105	4226	5175	5324	3983	4023	4227	4550	3387	3430

Table 7. Analytical Data for Subarea 3C
2020 Operation, Maintenance, and Monitoring Activities Memorandum
UCC Institute Facility, Institute, West Virginia

Notes:
µg/L = microgram(s) per liter
DOWN = location is downgradient from TTZ
J = results are estimated.
SIDE = location is side-gradient to TTZ
TTZ = target treatment zone
U = The analyte was analyzed for, but was not detected above the reported sample quantitation limit.
UCC = Union Carbide Corporation
UP = location is upgradient to TTZ

Table 8. Analytical Data for Subarea 3D
2020 Operation, Maintenance, and Monitoring Activities Memorandum
UCC Institute Facility, Institute, West Virginia

	Subarea	Inside 3D TTZ																		
	Location	TW-87A																		
	Sample Date	10/28/2015	2/16/2016	5/6/2016	9/16/2016	2/8/2017	5/16/2017	8/23/2017	12/17/2017	4/3/2018	6/27/2018	9/12/2018	10/30/2018	2/8/2019	4/5/2019	7/15/2019	2/5/2020	6/17/2020	9/3/2020	12/11/2020
Contaminant of Concern	Units																			
Carbon tetrachloride	µg/L	56800 J	7850	9540	7800	2710	2640	2710	706	440	860	1200	1000	460	1000	280	950 J	1200	580	840
Chloroform	µg/L	459	209	139	92.7	55.3 B	59.2	69.9	39 B	34	54	47	67	37	61	51	62 J	56	51	60
Tetrachloroethene	µg/L	58700	13000	12600	13200	6020	5570	5510	2400	1700	3400	3400	3000	1700	3500	1400	2600	3400	2000	3000
Trichlorofluoromethane	µg/L	779 J	101	105	77	50 U	53.6 B	50 U	20 U	13	23	30	35 J	17	40	28	58 J	86	38	50 U
Total	µg/L	116960.24	42320	22384	21169.7	8785.3	8322.8	8289.9	3145	2187	4337	4677	4102	2214	4601	1759	3670	4742	2669	3900

Table 8. Analytical Data for Subarea 3D
2020 Operation, Maintenance, and Monitoring Activities Memorandum
UCC Institute Facility, Institute, West Virginia

	Subarea	Inside 3D TTZ																		
	Location	TW-88A																		
	Sample Date	10/27/2015	2/12/2016	5/4/2016	9/15/2016	2/7/2017	5/11/2017	8/18/2017	12/17/2017	4/2/2018	6/26/2018	9/12/2018	10/29/2018	2/7/2019	4/5/2019	7/15/2019	2/4/2020	6/16/2020	9/1/2020	12/10/2020
Contaminant of Concern	Units																			
Carbon tetrachloride	µg/L	3120	594	379	230	127	375	167	188	22	220	170	140 J	140	250	160 J	71	48	48	59
Chloroform	µg/L	166	169	120	73.7	37.2	77.7	105	70.7	6.3	120	120	120 J	110	130	120 J	40	20	14	33
Tetrachloroethene	µg/L	4460	1620	1000	763	507	950	468	714	87	660 J	500 J	81 J	510	710	550 J	290	140	150	200
Trichlorofluoromethane	µg/L	235 J	131	78.5 B	44.7 B	20.7	58.6	48.4	36.8	3.8	54	38	40 J	34	57	55 J	21	8.6	8.2	14
Total	µg/L	8029.1	5028	1577.5	1111.4	691.9	1461.3	795.66	1015.24	119.1	1061	834.3	389.9	794	1153	891.3	422	218.3	221.7	311.1

Table 8. Analytical Data for Subarea 3D
2020 Operation, Maintenance, and Monitoring Activities Memorandum
UCC Institute Facility, Institute, West Virginia

	Subarea	Inside 3D TTZ																			
	Location	TW-90B																			
	Sample Date	10/27/2015	2/16/2016	5/4/2016	5/4/2016	9/15/2016	9/15/2016	2/6/2017	5/11/2017	8/18/2017	12/15/2017	3/30/2018	6/27/2018	9/12/2018	10/30/2018	2/8/2019	7/17/2019	2/6/2020	6/16/2020	9/1/2020	12/9/2020
Contaminant of Concern	Units																				
Carbon tetrachloride	µg/L	47900	240	77.2	75.2	76	75.2	95	245	1290	2000	1800	1400	2800	3300	2400	3500 J	57	24 J	23	23
Chloroform	µg/L	2060	485	227	224	170	172	132	211	339	441	550	660	920	850	1000	1000 J	120	100 J	68	53
Tetrachloroethene	µg/L	36600	723	312	313	313	307	343	573	1760	2970	2700	2700	4400	4600	4600	5100 J	190	110 J	99	86
Trichlorofluoromethane	µg/L	3820 J	242	117	105	74.5	78.1	49.1	105	331	466	640	420	870	680	920	460 J	25 J	14	8.7	16
Total	µg/L	90682.34	3390.46	738.71	722.57	633.5	632.3	619.1	1140.46	3728.42	5877	5690	5180	9001	9430	8938	10060	392	249.5	200	179.2

Table 8. Analytical Data for Subarea 3D
2020 Operation, Maintenance, and Monitoring Activities Memorandum
UCC Institute Facility, Institute, West Virginia

	Subarea	Inside 3D TTZ																			
	Location	TW-92B																			
	Sample Date	10/28/2015	10/28/2015	2/15/2016	5/4/2016	9/15/2016	2/6/2017	5/11/2017	8/21/2017	12/12/2017	3/30/2018	6/27/2018	9/12/2018	10/31/2018	2/7/2019	4/9/2019	7/17/2019	2/6/2020	6/16/2020	9/3/2020	12/9/2020
Contaminant of Concern	Units																				
Carbon tetrachloride	µg/L	31300	33500	264	118	44.4	27.4	540	1670	2760	2100	2500	3800	4800	4400	4000	6200	34	24	65	16
Chloroform	µg/L	6360	6900	919	609	226	112	292	619	897	890	2000	1300	2200	2200	2400	1900	140	100 J	110	85
Tetrachloroethene	µg/L	21400	21800	739	529	223	97.9	638	1850	3230	2600	3600	3500	4200	4500	5300	6200	120	69 J	120	46
Trichlorofluoromethane	µg/L	11900 J	13600 J	279	578	104	40.2	141	406	843	670	2200	1000 J	1900	1800	2100	1900	34	32 J	12	23
Total	µg/L	71633.75	76661.02	4450.28	1848.72	602.75	287.34	1618.71	4564.15	7749.5	6286	10361	9615	13159	12956	13859	16251	331.4	227.15	307	171.1

Table 8. Analytical Data for Subarea 3D
2020 Operation, Maintenance, and Monitoring Activities Memorandum
UCC Institute Facility, Institute, West Virginia

	Subarea	Inside 3D TTZ																		
	Location	TW-93B																		
	Sample Date	10/27/2015	2/12/2016	5/5/2016	9/15/2016	2/7/2017	5/15/2017	8/22/2017	12/15/2017	4/3/2018	6/27/2018	9/13/2018	10/30/2018	2/7/2019	4/9/2019	7/17/2019	2/5/2020	6/16/2020	9/2/2020	12/15/2020
Contaminant of Concern	Units																			
Carbon tetrachloride	µg/L	15000	1710	1200	906	869	1890	2290	2160	2900	3400	3400	3800	4600	3500	3600 J	740	760 J	810	720
Chloroform	µg/L	7790	3570	1950	1580	1220	1160	1490	1010	2800	1700	1400	2400	3000	2600	2600 J	1600	1500 J	1100	1100
Tetrachloroethene	µg/L	8340	2040	1500	903	779	2100	1610	2310	1500	3200	3600	3300	3500	2900	2400 J	560	780 J	1200	810
Trichlorofluoromethane	µg/L	11000 J	948	581	488	457	668	1090	576	2200	990 J	780	1500 J	1800	1600	1600 J	460	410 J	230	250
Total	µg/L	42486.5	16680.8	5265.7	3895.6	3341.1	5831.6	6511.4	6056	9448	9304	9180	11027	12900	10600	10233	3360	3459.2	3340	2880

Table 8. Analytical Data for Subarea 3D
2020 Operation, Maintenance, and Monitoring Activities Memorandum
UCC Institute Facility, Institute, West Virginia

	Subarea	Outside 3D TTZ																		
	Location	TW-86A (UP)																		
	Sample Date	10/26/2015	2/11/2016	5/5/2016	9/15/2016	2/7/2017	5/12/2017	8/22/2017	12/17/2017	4/2/2018	6/27/2018	9/12/2018	10/30/2018	2/8/2019	4/5/2019	7/16/2019	2/5/2020	6/16/2020	9/2/2020	12/10/2020
Contaminant of Concern	Units																			
Carbon tetrachloride	µg/L	230	457	516	427	344	458	336	413	220	660	580	700	630	550	530	4.7	420	130	350
Chloroform	µg/L	62.9	28.7	23.9	21.8	21.5 B	40.7	73.9	61.4	33	47	57	56	53	50	48	0.6	36	18	39
Tetrachloroethene	µg/L	576	908	866	821	783	1030	863	1060	640	1800	1600	1900	2100	1800	2000	26	1300	480	1300
Trichlorofluoromethane	µg/L	62.3 J	322	257	312	235	352	284	263	110	340	290	280	250	230	200	1.3	330	91	210
Total	µg/L	942.64	17387.2	1675	1592.5	1388.8	1885.89	1570.07	1797.4	1013.6	2847	2527	2936	3038.3	2630	2778	32.6	2086	1919	1909

Table 8. Analytical Data for Subarea 3D
2020 Operation, Maintenance, and Monitoring Activities Memorandum
UCC Institute Facility, Institute, West Virginia

	Subarea	Outside 3D TTZ																
	Location	TW-89A (SIDE/DOWN)																
	Sample Date	10/27/2015	2/12/2016	5/5/2016	9/15/2016	2/8/2017	5/15/2017	8/21/2017	12/15/2017	4/3/2018	6/27/2018	9/12/2018	10/30/2018	8/2/2019	2/5/2020	6/17/2020	8/28/2020	12/15/2020
Contaminant of Concern	Units																	
Carbon tetrachloride	µg/L	10.2 K	10 U	10 U	20 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	1 U	2.5 U	5 U
Chloroform	µg/L	829	542	315	104	42.4 B	10 U	20.4 B	36.8	100	58	14	29	130	80	78	25	64
Tetrachloroethene	µg/L	7280	2050	2940	2450	1760	2010	1690	1840	1800	1600	2100	2200	1800	650	360	490	390
Trichlorofluoromethane	µg/L	644 J	214	144	48	37.1	22.6	26.2	53.2	110	80	22	31	150	44	26	13	19
Total	µg/L	8955.58	5612	3414.1	2602	1850.6	2059.9	1754.2	1945	2023	1749	2136	2260	2080	774	470.8	531.6	473

Table 8. Analytical Data for Subarea 3D
2020 Operation, Maintenance, and Monitoring Activities Memorandum
UCC Institute Facility, Institute, West Virginia

	Subarea	Outside 3D TTZ																		
	Location	TW-91B (SIDE)																		
	Sample Date	10/27/2015	2/12/2016	5/4/2016	9/16/2016	2/8/2017	5/16/2017	8/23/2017	12/17/2017	4/4/2018	6/28/2018	9/13/2018	10/30/2018	2/8/2019	4/9/2019	7/16/2019	2/6/2020	6/18/2020	9/3/2020	12/15/2020
Contaminant of Concern	Units																			
Carbon tetrachloride	µg/L	2970	1670	1270	636	418	680	676	1000	1300	1400	1300	1400	1400	1200	1400 J	680 J	350	350	280
Chloroform	µg/L	5750	6430	6810	4030	3210	3450	4680	4420	3500	3600	4100	3900	2600	3200	2300 J	3200	3200 J	1700	1800
Tetrachloroethene	µg/L	2760	3220	2920	1530	1330	1900	1640	1850	2000	2200	2200	1800	1500	2000	1900 J	1500	1300	1100	1100
Trichlorofluoromethane	µg/L	21700 J	23800	23800	9540	5850	6760	8930	9570	9400	5900	7200	8200 J	5700	5300	4300 J	5500 J	4700 J	1900	1800
Total	µg/L	34325.81	72820	36260	16326	11156	13174	16454.2	17232	16370	13270	15030	15530	11340	11840	9996	11090	9800.6	5183.1	5047

Table 8. Analytical Data for Subarea 3D
2020 Operation, Maintenance, and Monitoring Activities Memorandum
UCC Institute Facility, Institute, West Virginia

	Subarea	Outside 3D TTZ																	
	Location	TW-94B (DOWN)																	
	Sample Date	10/27/2015	5/6/2016	9/16/2016	2/7/2017	5/16/2017	8/23/2017	12/17/2017	4/3/2018	6/27/2018	9/12/2018	10/30/2018	2/7/2019	4/5/2019	7/16/2019	2/5/2020	6/17/2020	9/2/2020	12/11/2020
Contaminant of Concern	Units																		
Carbon tetrachloride	µg/L	2.69 K	25 U	25 U	25 U	25 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	25 U	25 UJ	25 U	13 U	50 U	50 U
Chloroform	µg/L	1200	1580	1050	851	908	1090	1090	780	1000	970	690	1100	1200	790 J	740	900	590	460
Tetrachloroethene	µg/L	5820	6390	6530	4700	6550	5190	5920	5400	5900	5000	4000	5800	5400	4300 J	4400	5300	4500	3700
Trichlorofluoromethane	µg/L	298	235	109	73.7	98.4	97.7	96.9	67	110	89	70	86	80	82 J	91	85	56	50 U
Total	µg/L	7541.2	8307	7970.4	5660.6	7616.1	6533.7	7106.9	6247	7010	6059	4760	7058	6783	5240	5263	6391	5146	4160

Table 8. Analytical Data for Subarea 3D
2020 Operation, Maintenance, and Monitoring Activities Memorandum
UCC Institute Facility, Institute, West Virginia

Notes:

µg/L = microgram(s) per liter

B = analyte reported in blank at similar concentrations

DOWN = location is downgradient from TTZ

J = result is estimated

K = result may be estimated high

SIDE = location is side-gradient to TTZ

TTZ = target treatment zone

U = The analyte was analyzed for, but was not detected above the reported sample quantitation limit.

UCC = Union Carbide Corporation

UJ = The analyte was below the reported sample quantitation limit. However, the reported value is approximate

UP = location is upgradient to TTZ

Figures

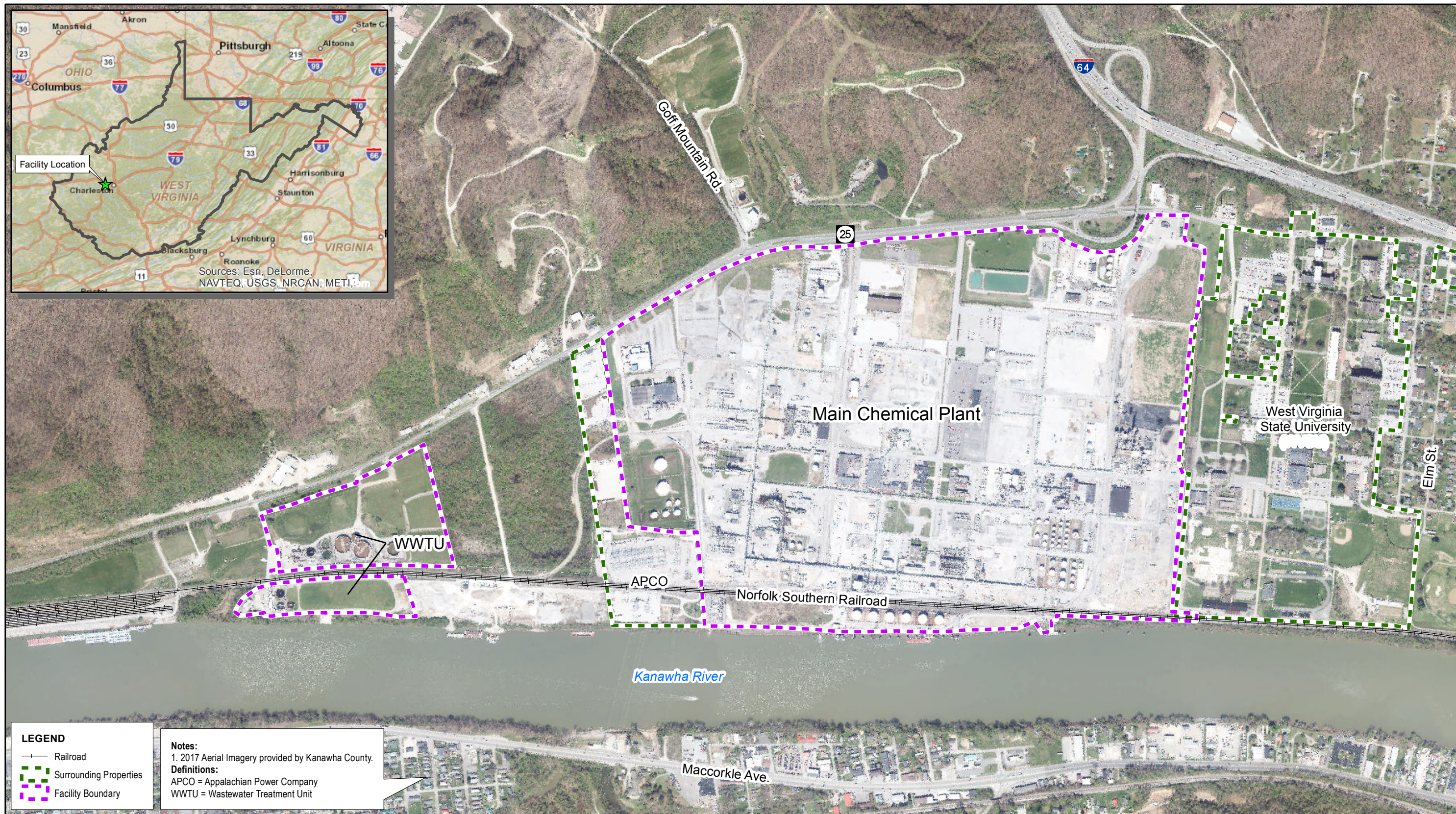


Figure 1.
Facility Location Map
2020 Operation, Maintenance, and Monitoring Activities Memorandum
Union Carbide Corporation Institute Facility, Institute, West Virginia

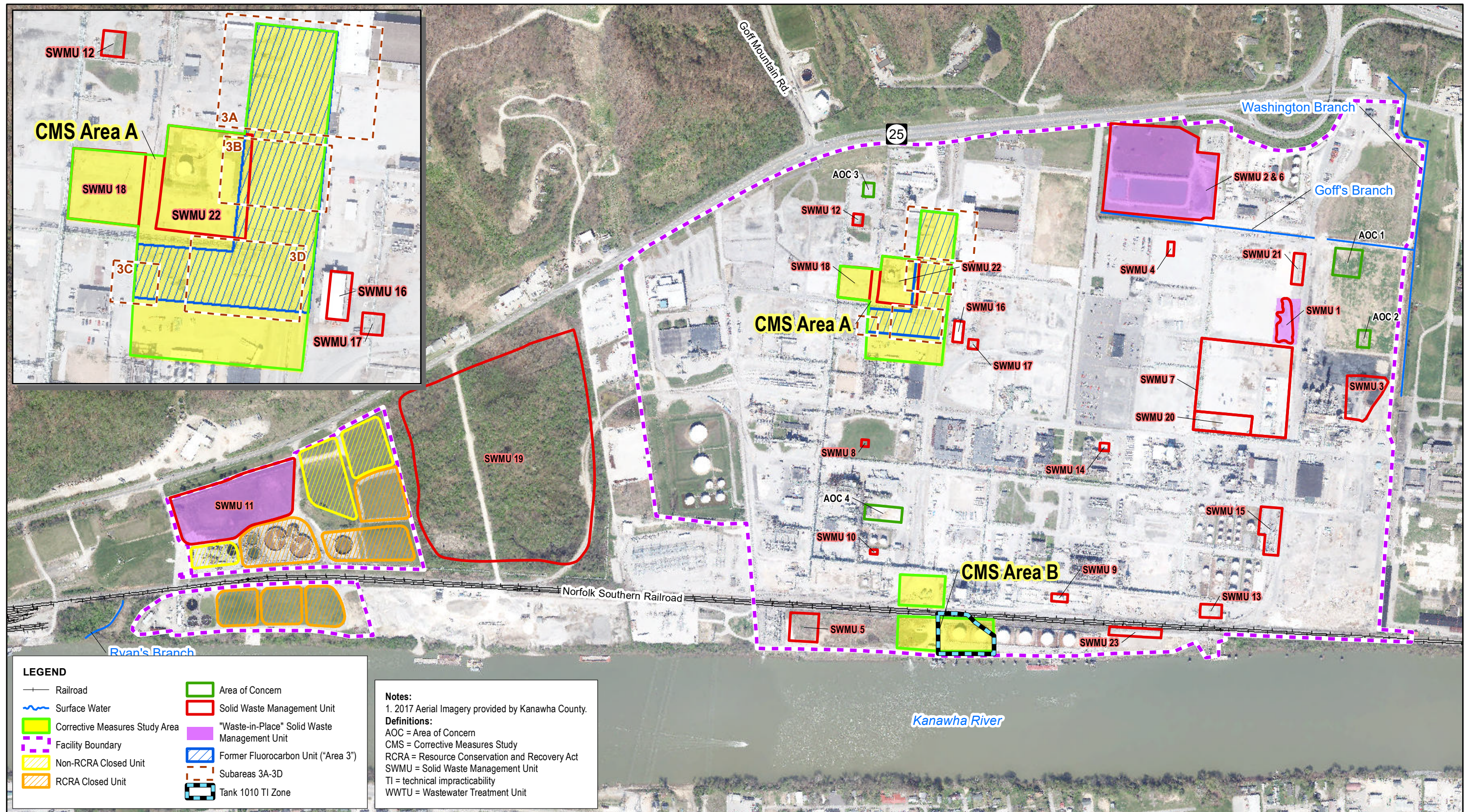


Figure 2.
 Area Designation Map
 2020 Operation, Maintenance, and Monitoring Activities Memorandum
 Union Carbide Corporation Institute Facility, Institute, West Virginia

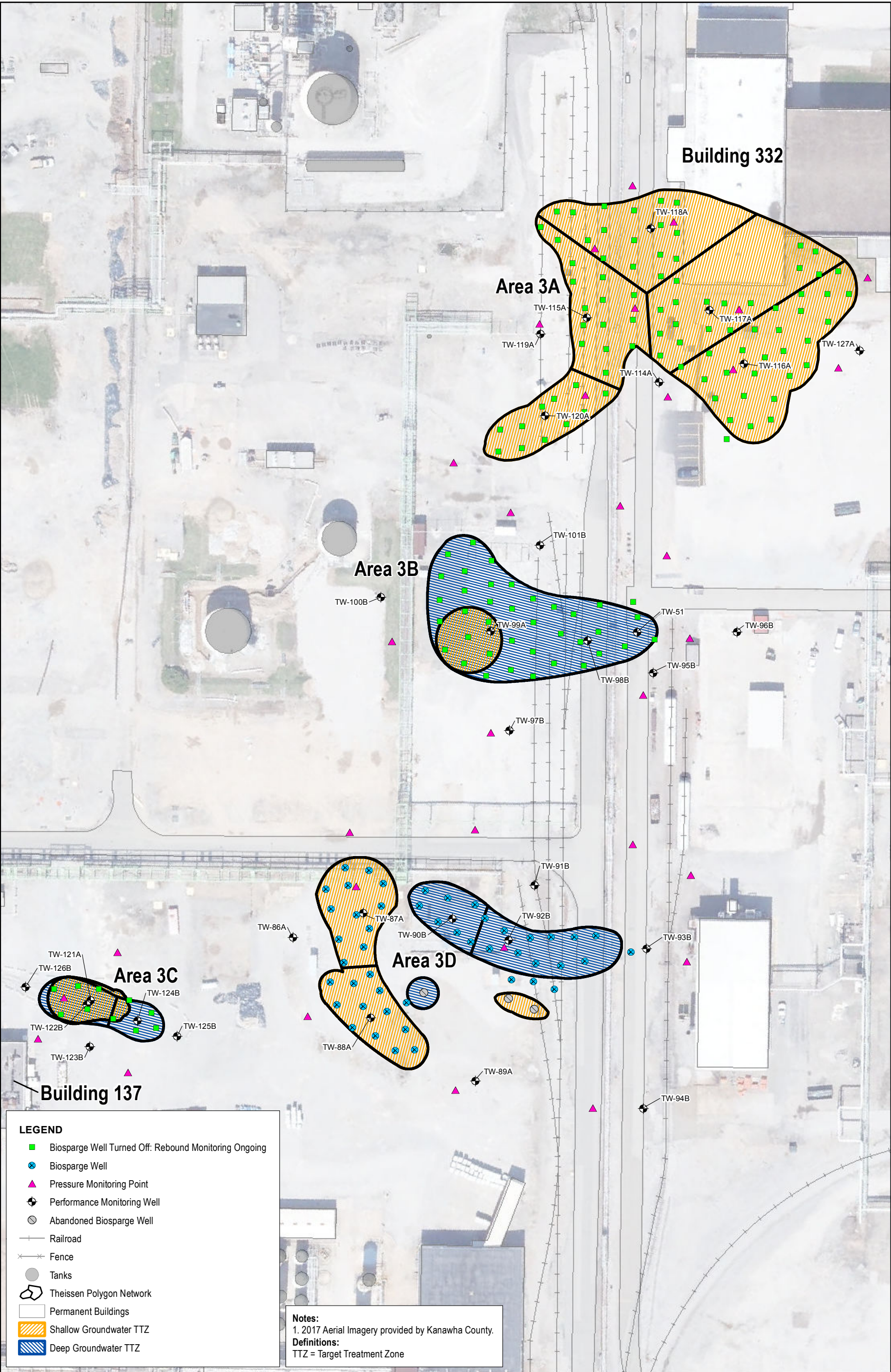
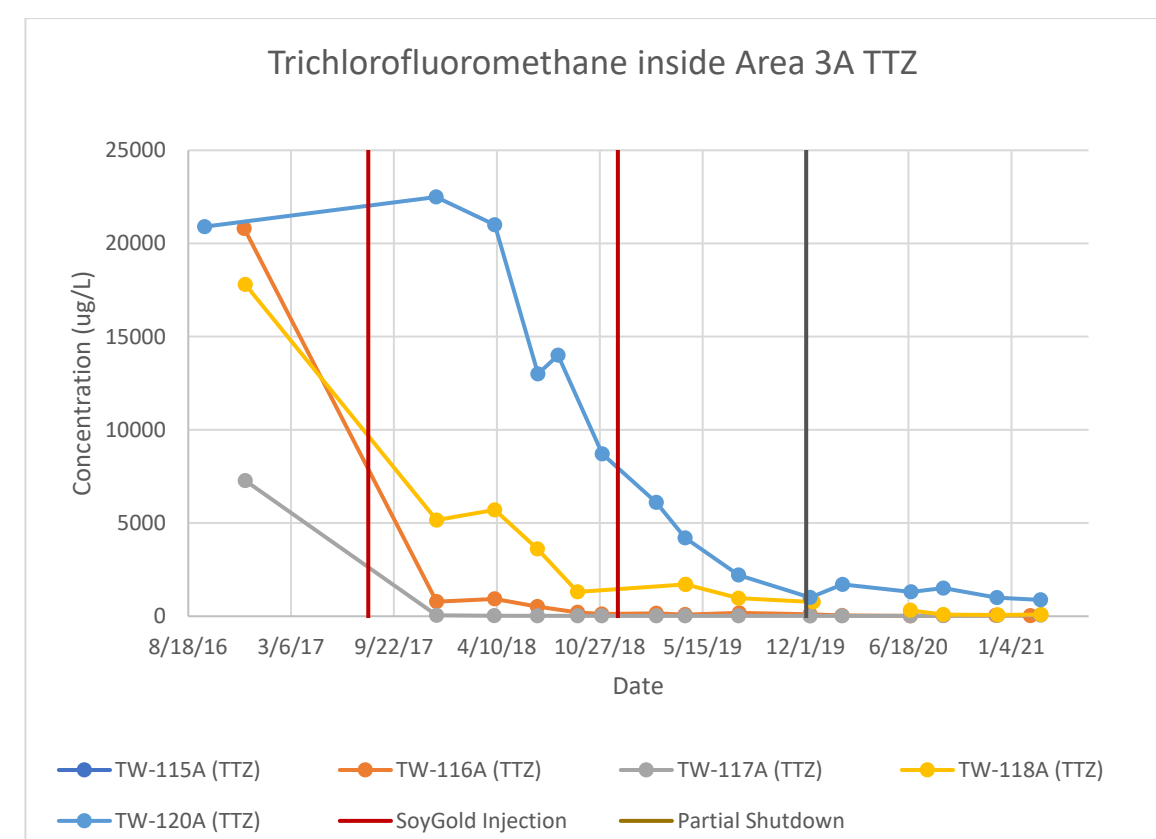
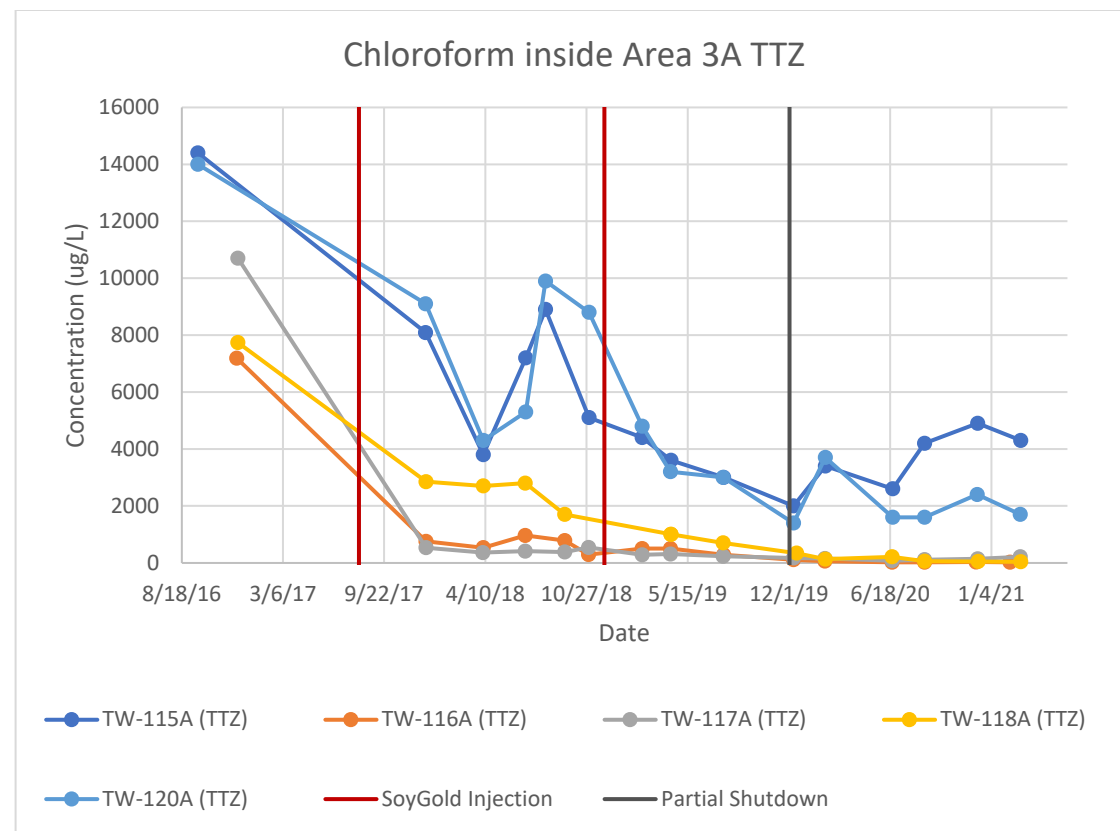
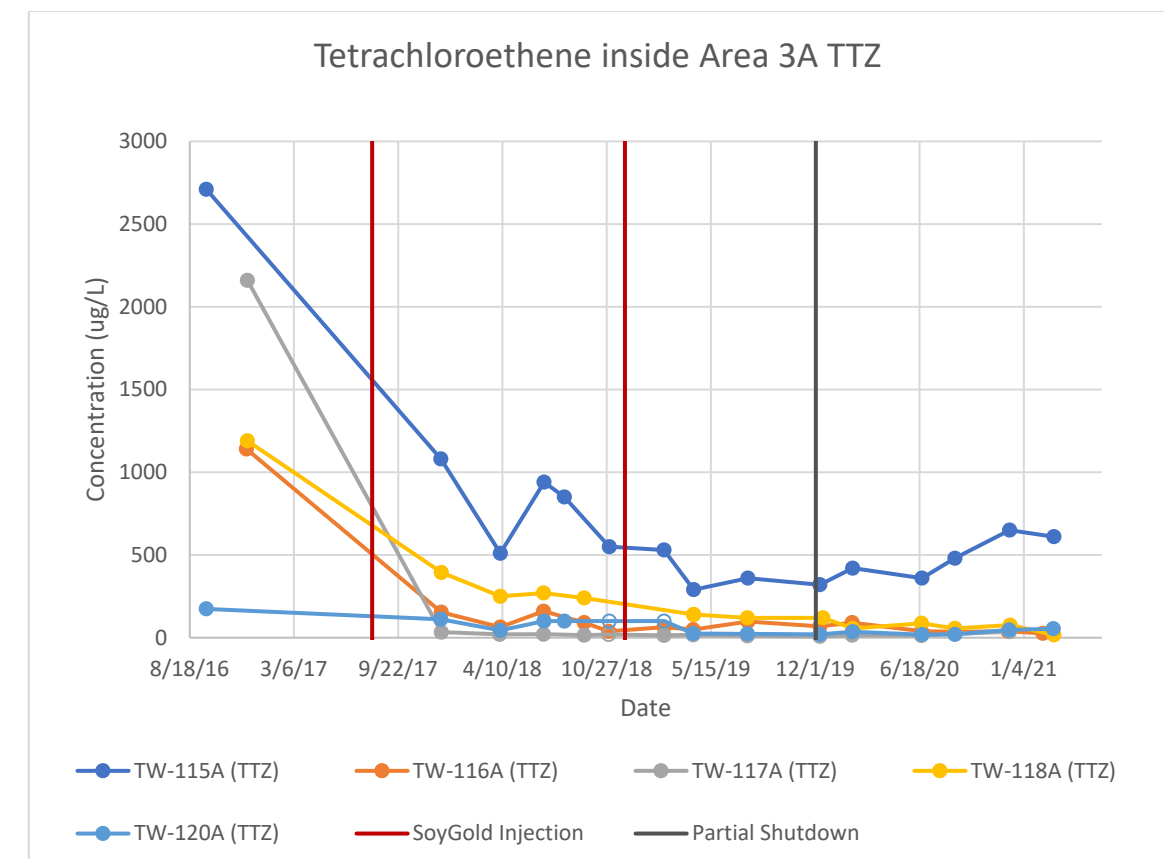
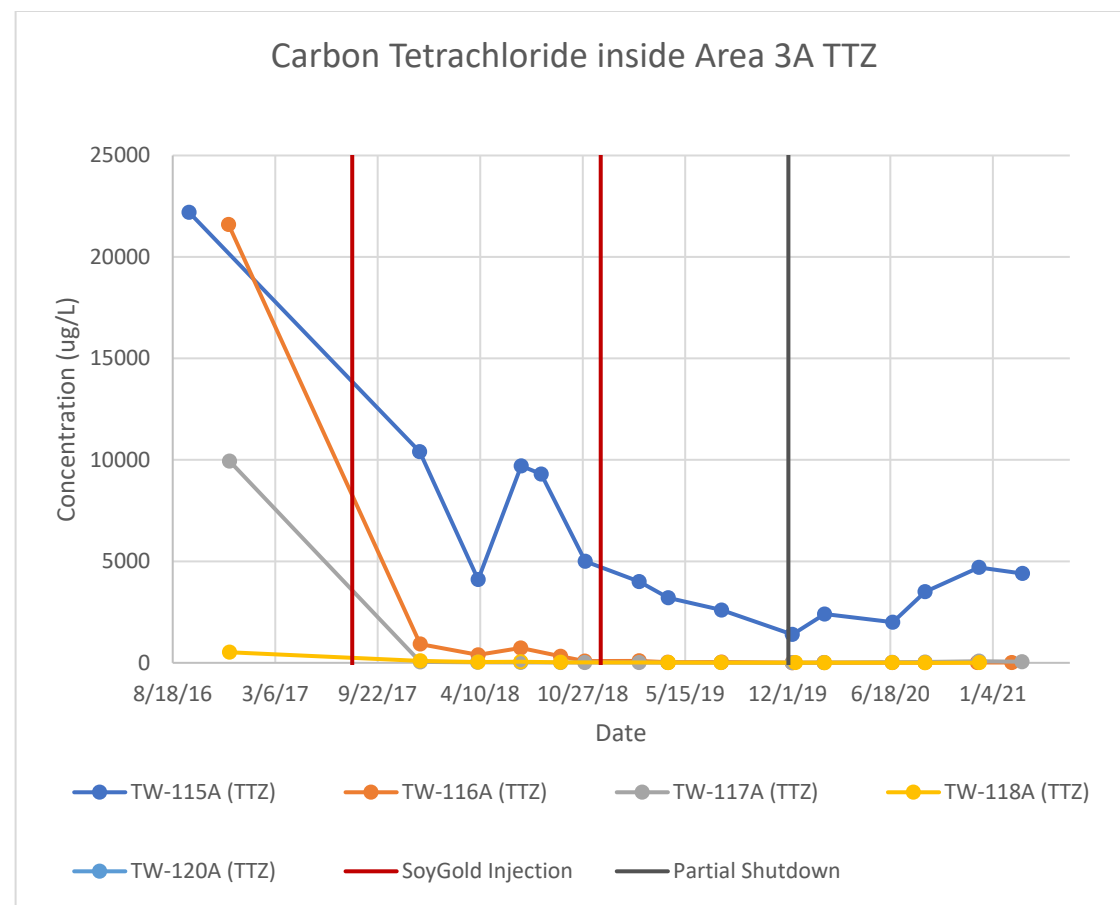


Figure 3.
Site Map - Areas 3A, 3B, 3C and 3D
2020 Operation, Maintenance, and Monitoring Activities Memorandum
UCC Institute Facility, Institute, West Virginia



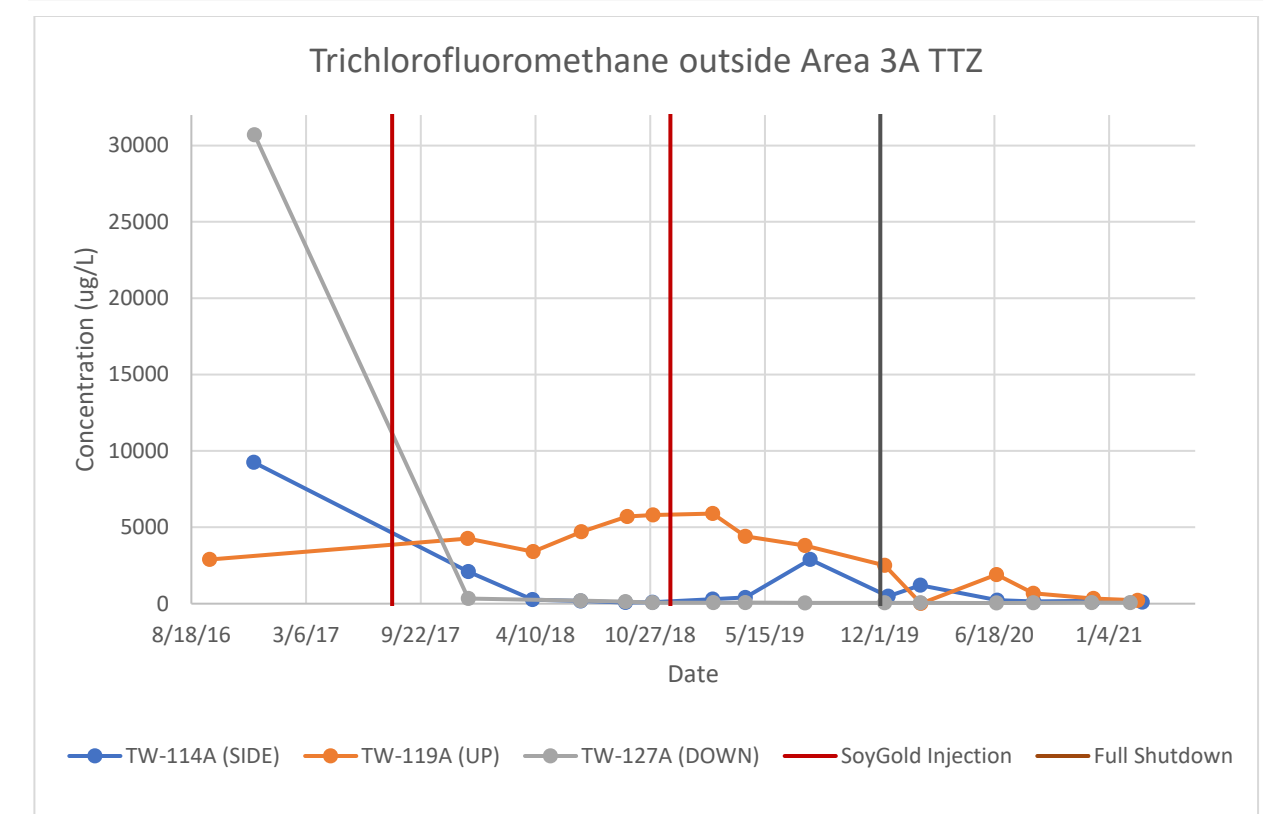
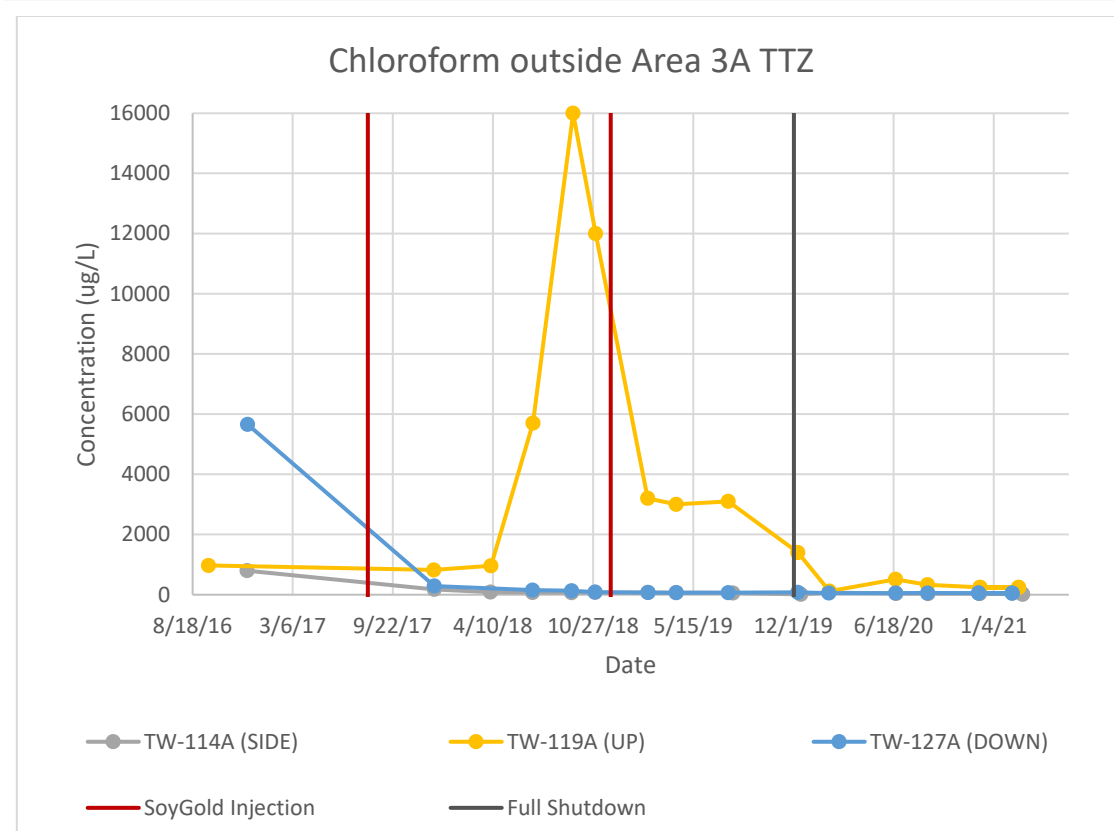
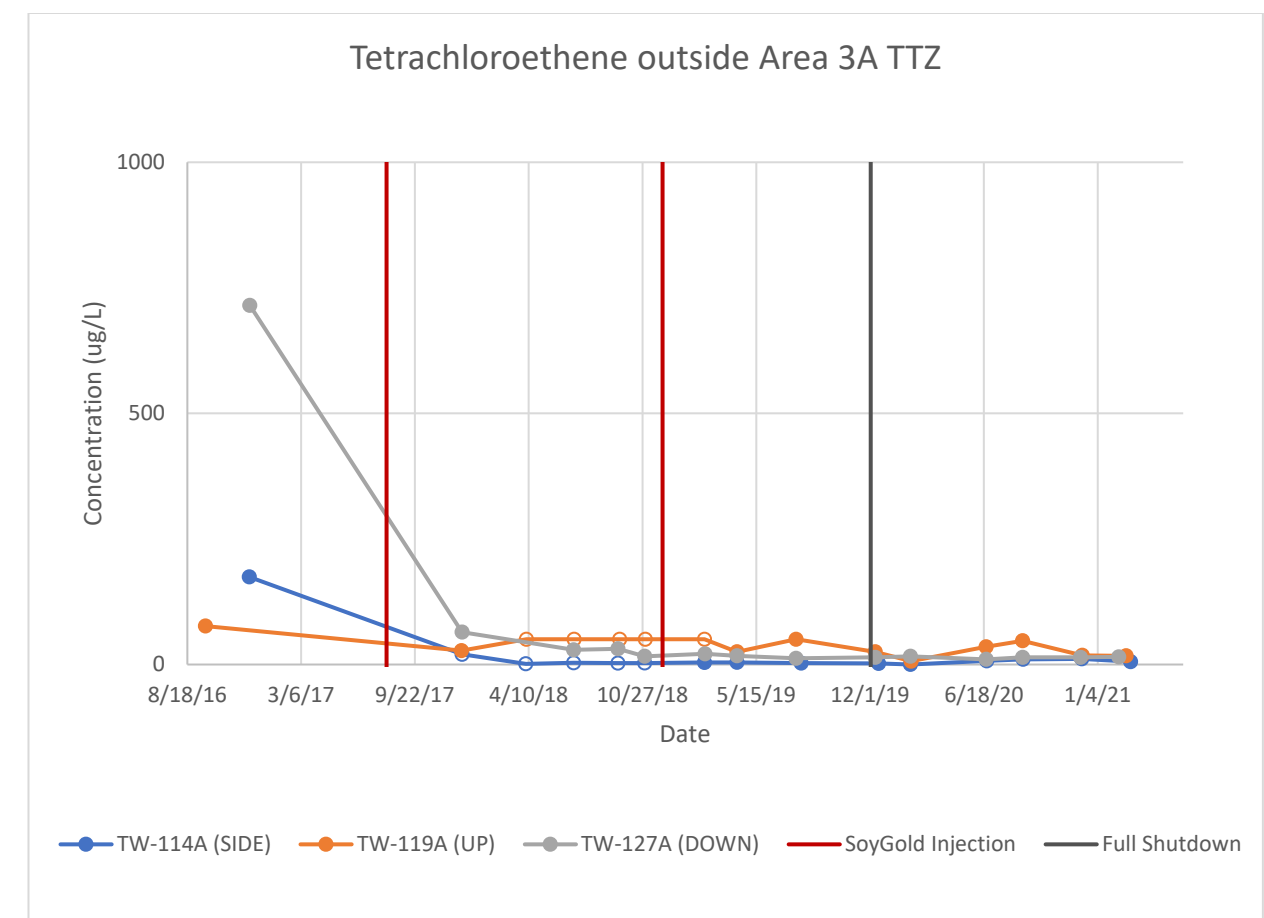
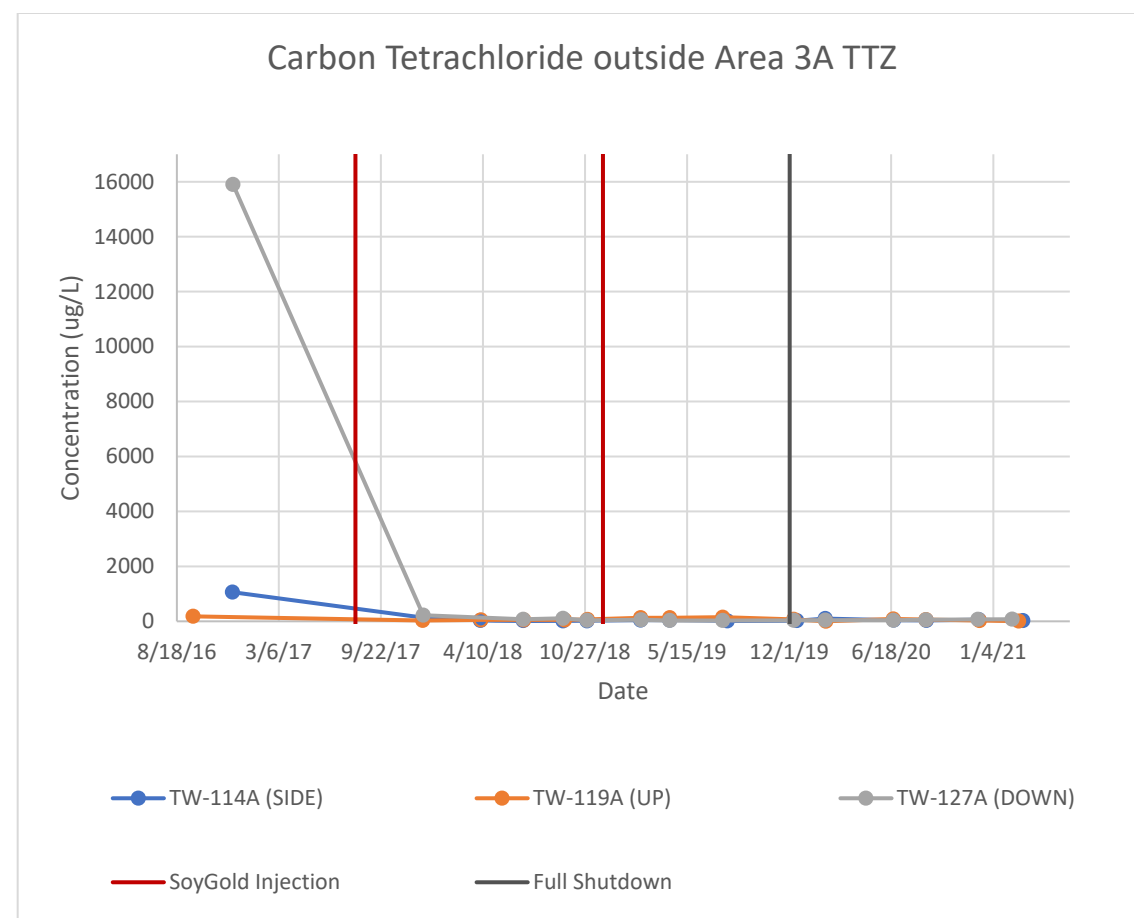


Notes

TTZ = target treatment zone Open circles = result non-detect

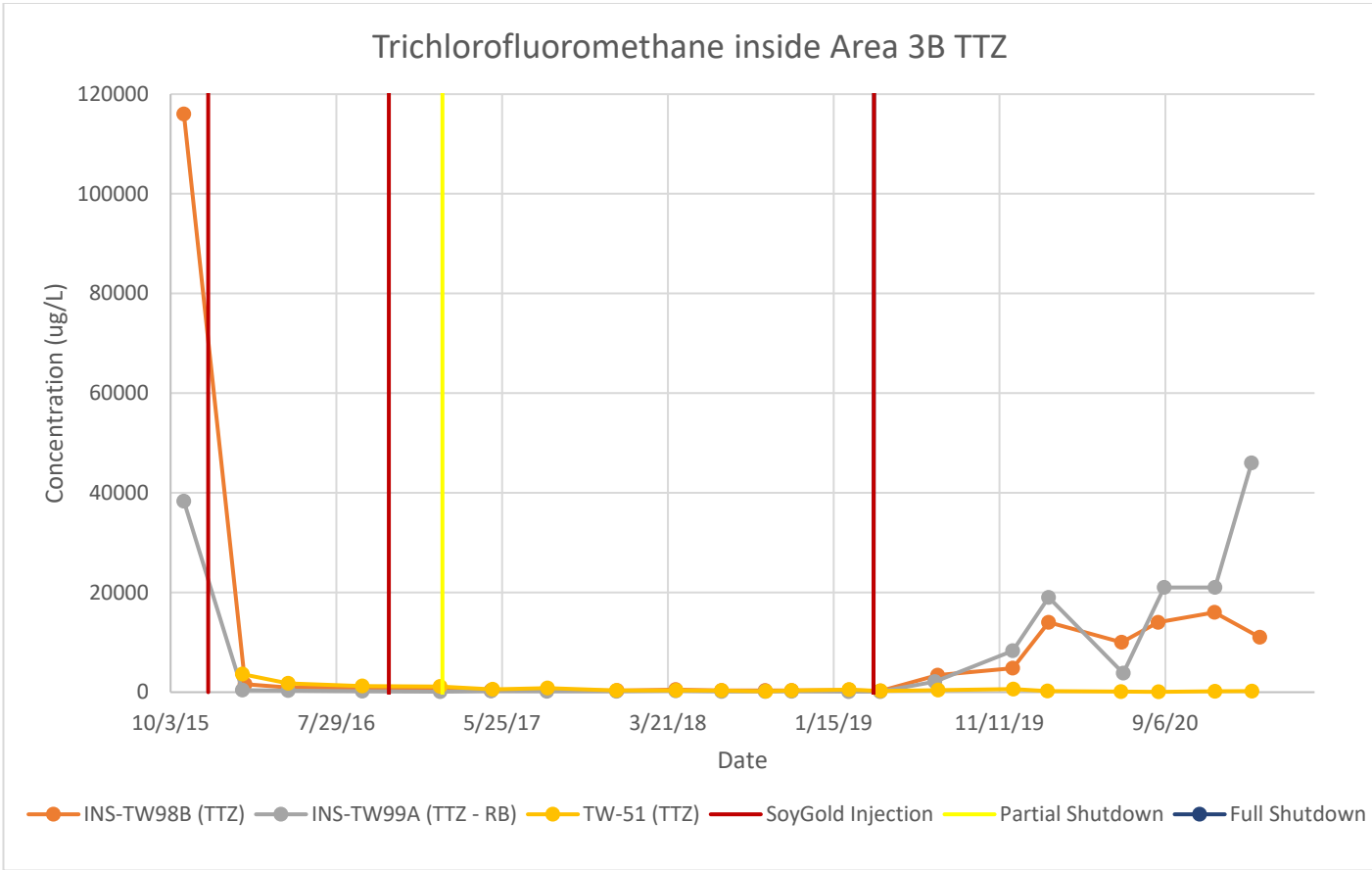
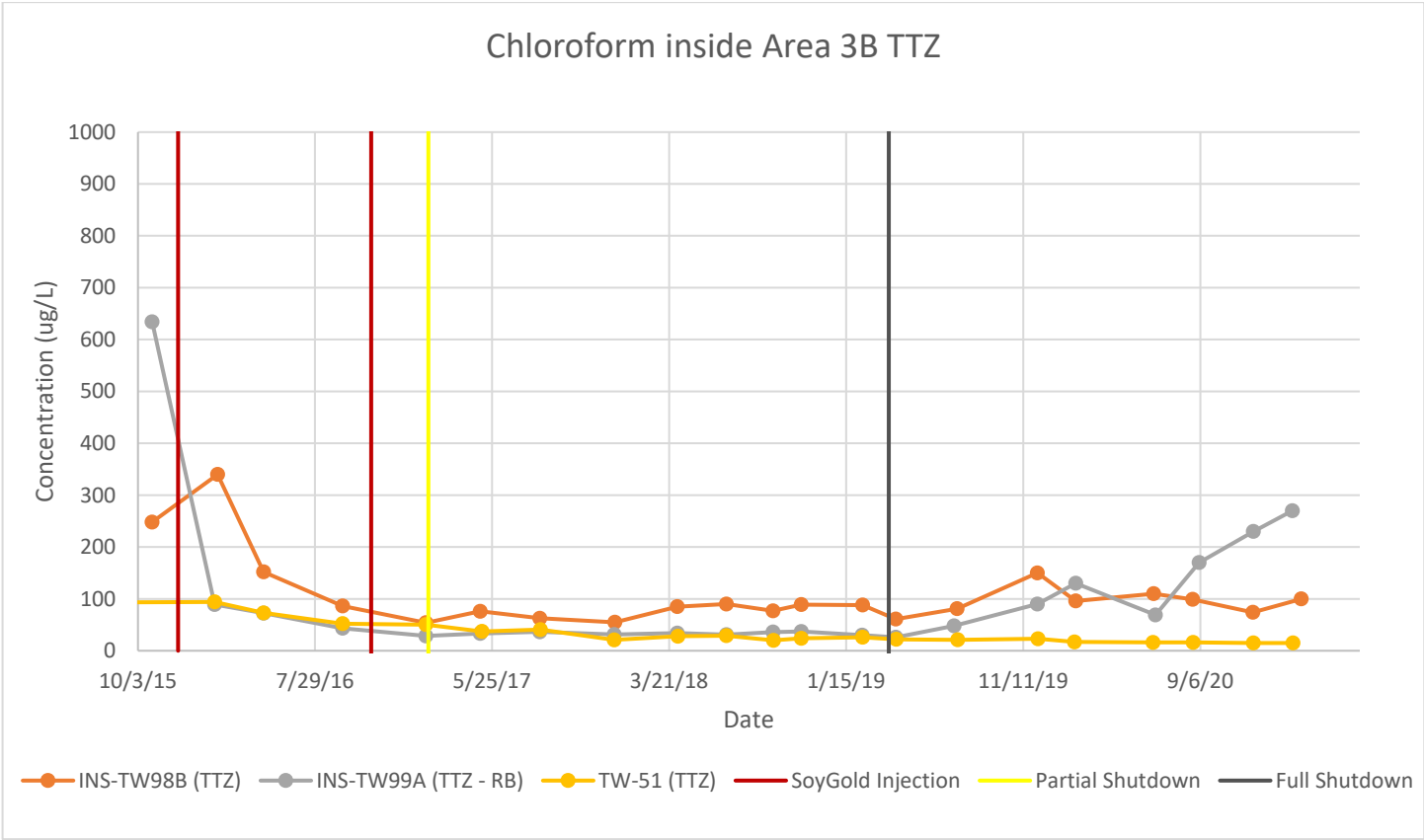
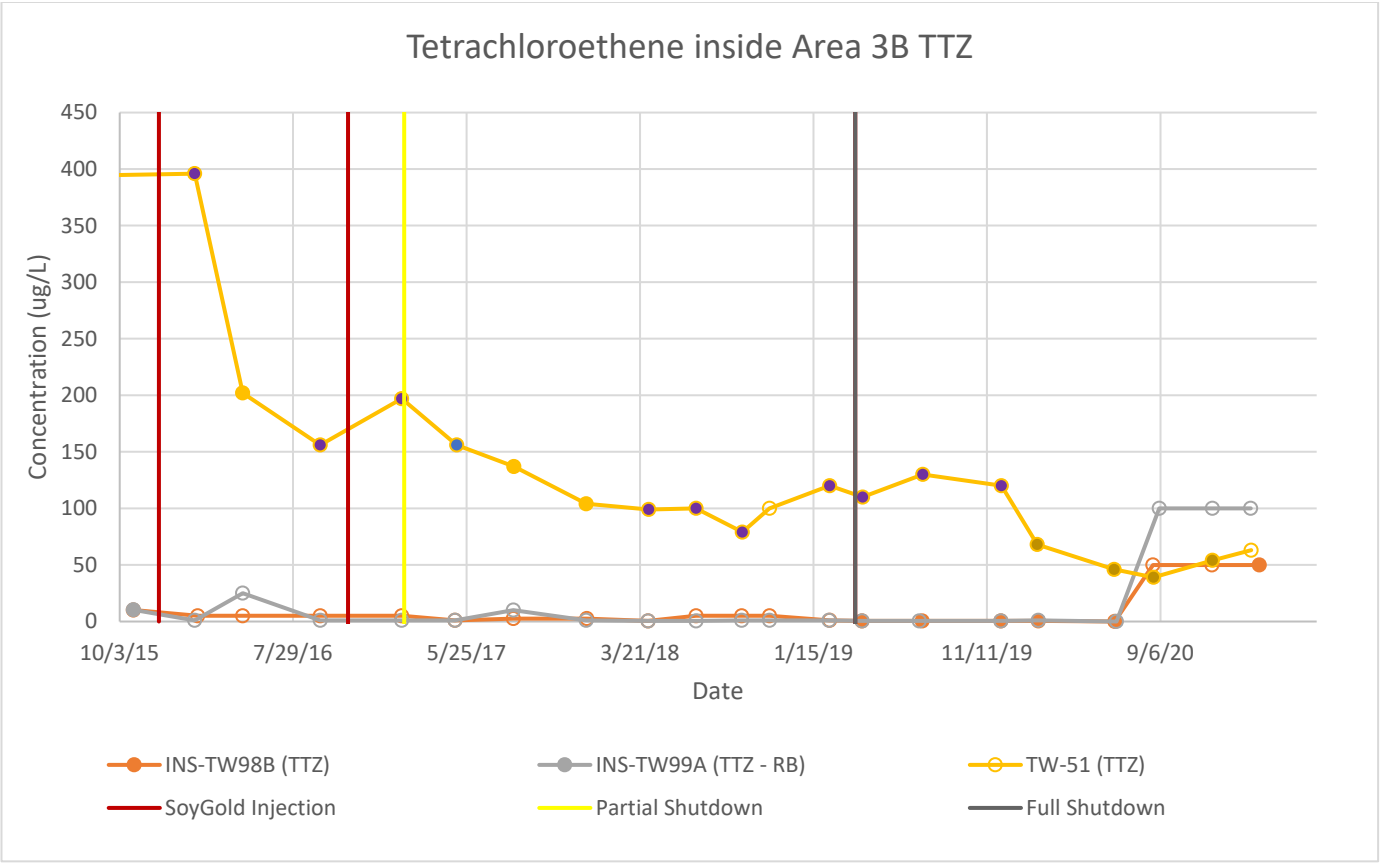
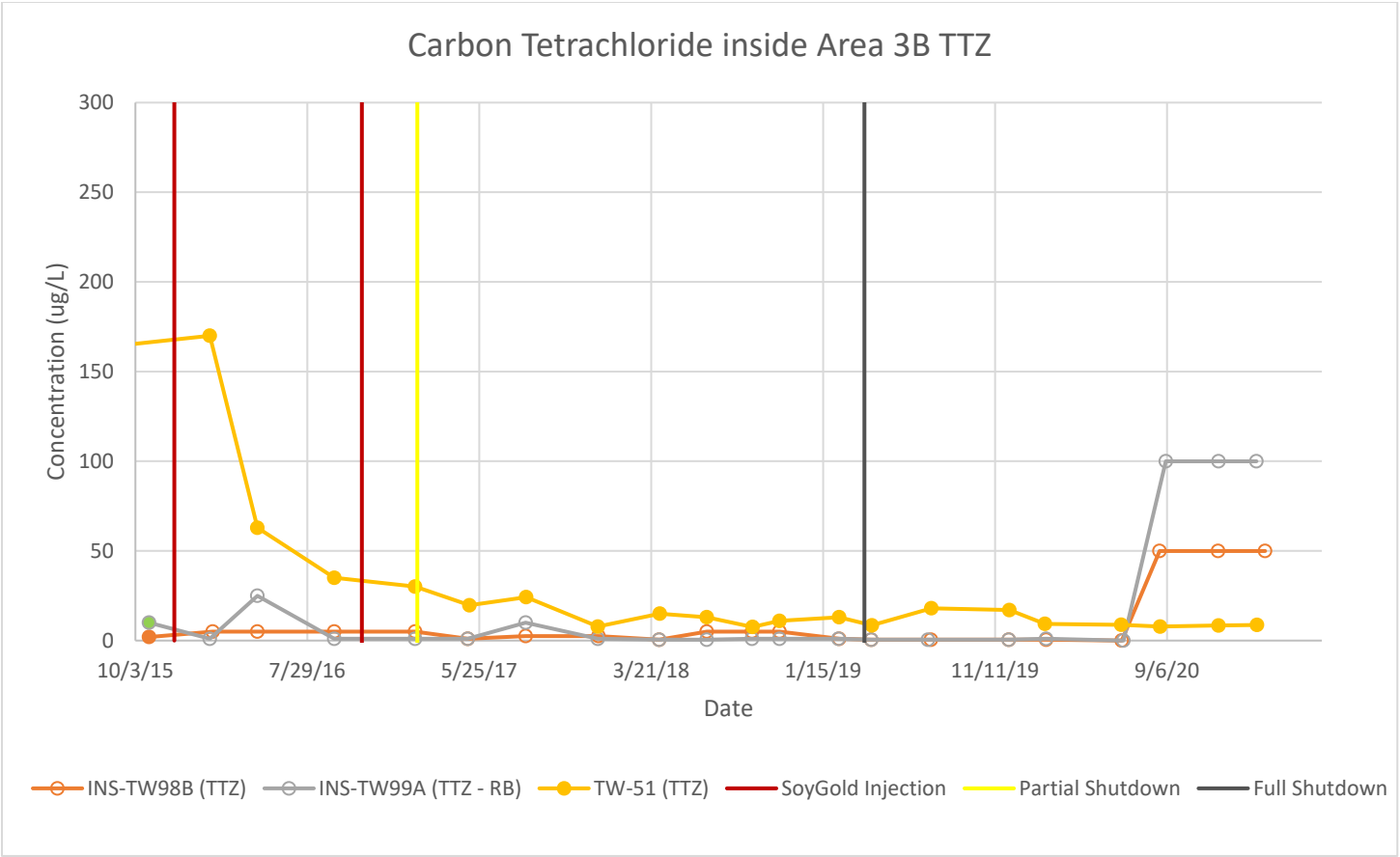
µg/L = microgram(s) per liter

Figure 4. Trend Graphs for Constituents of Concern Inside Area 3A Target Treatment Zone
 2020 Operation, Maintenance, and Monitoring Activities Memorandum
 UCC Institute Facility, Institute, West Virginia



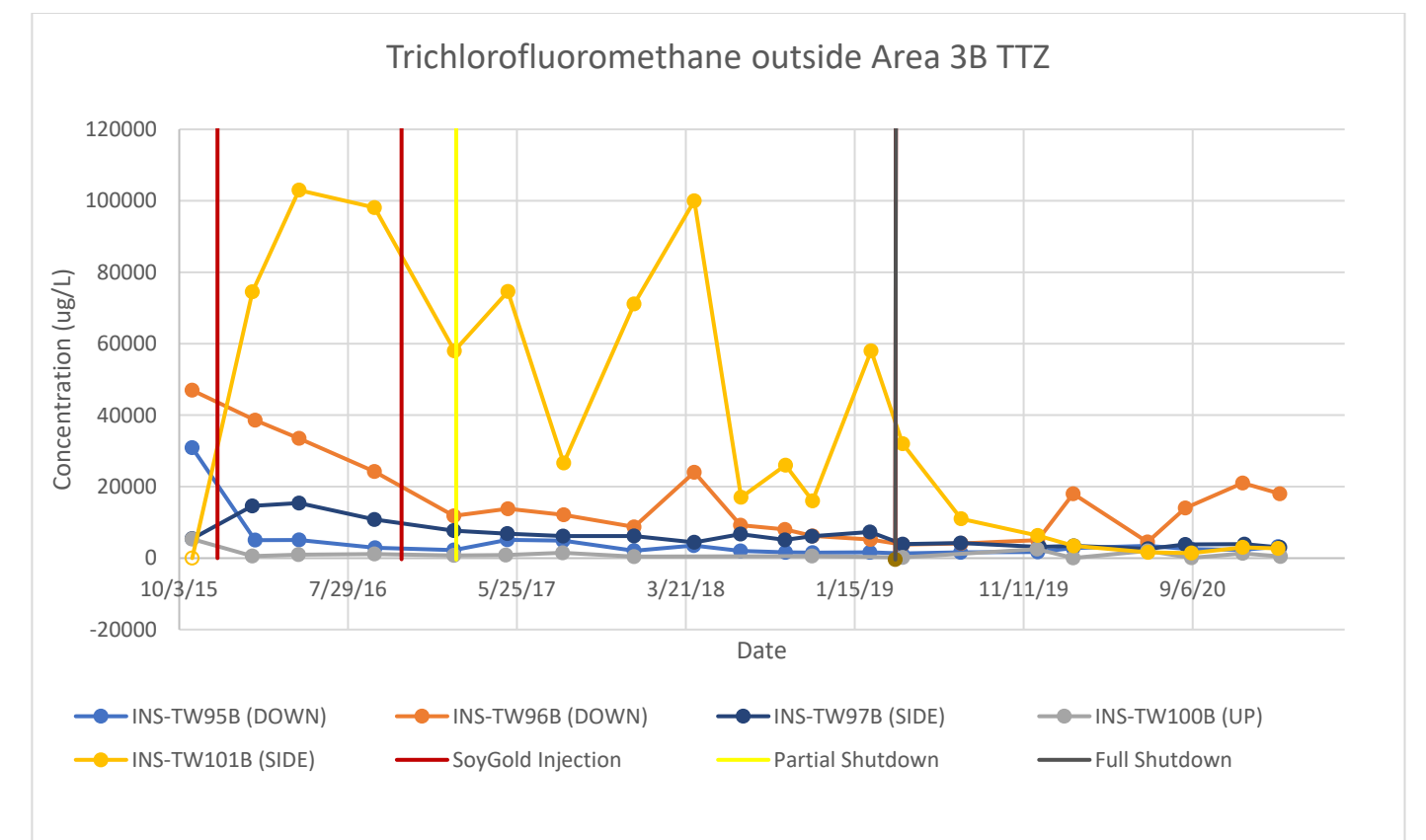
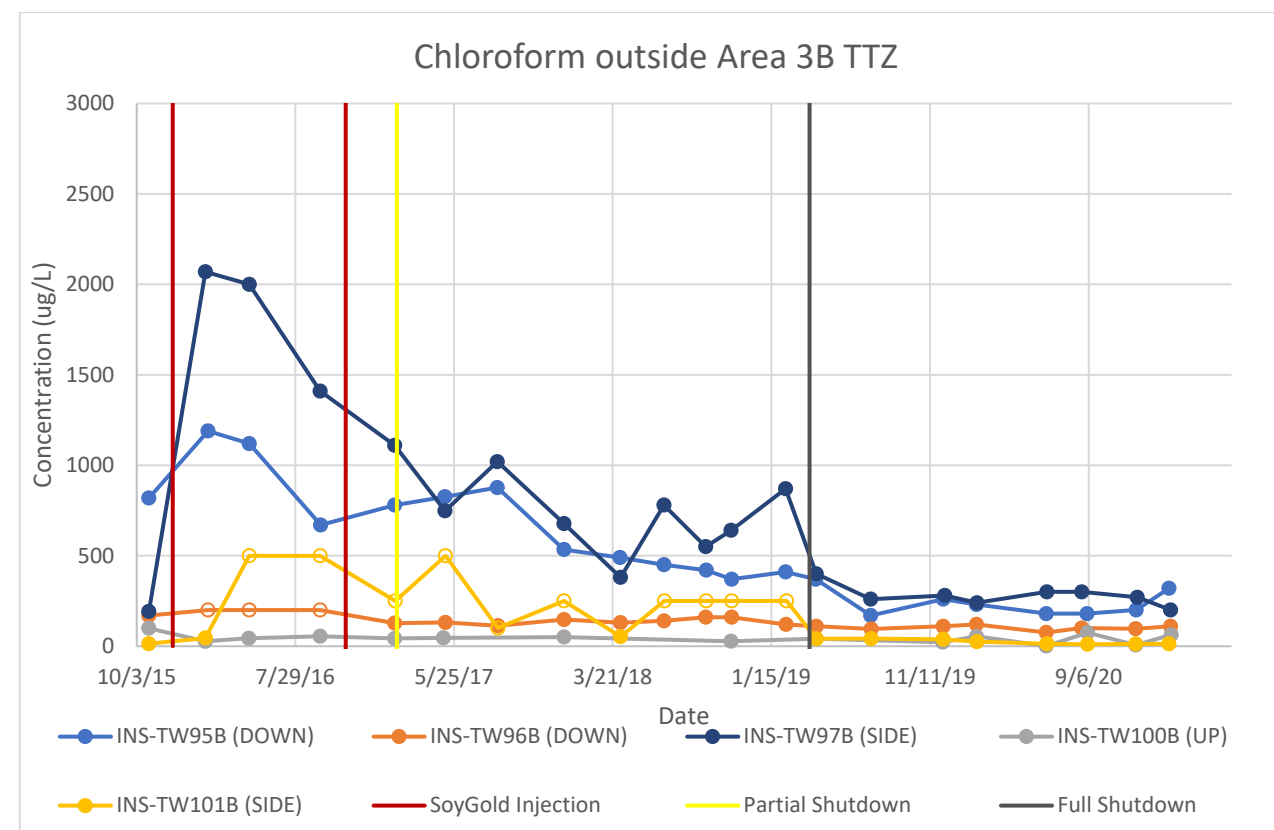
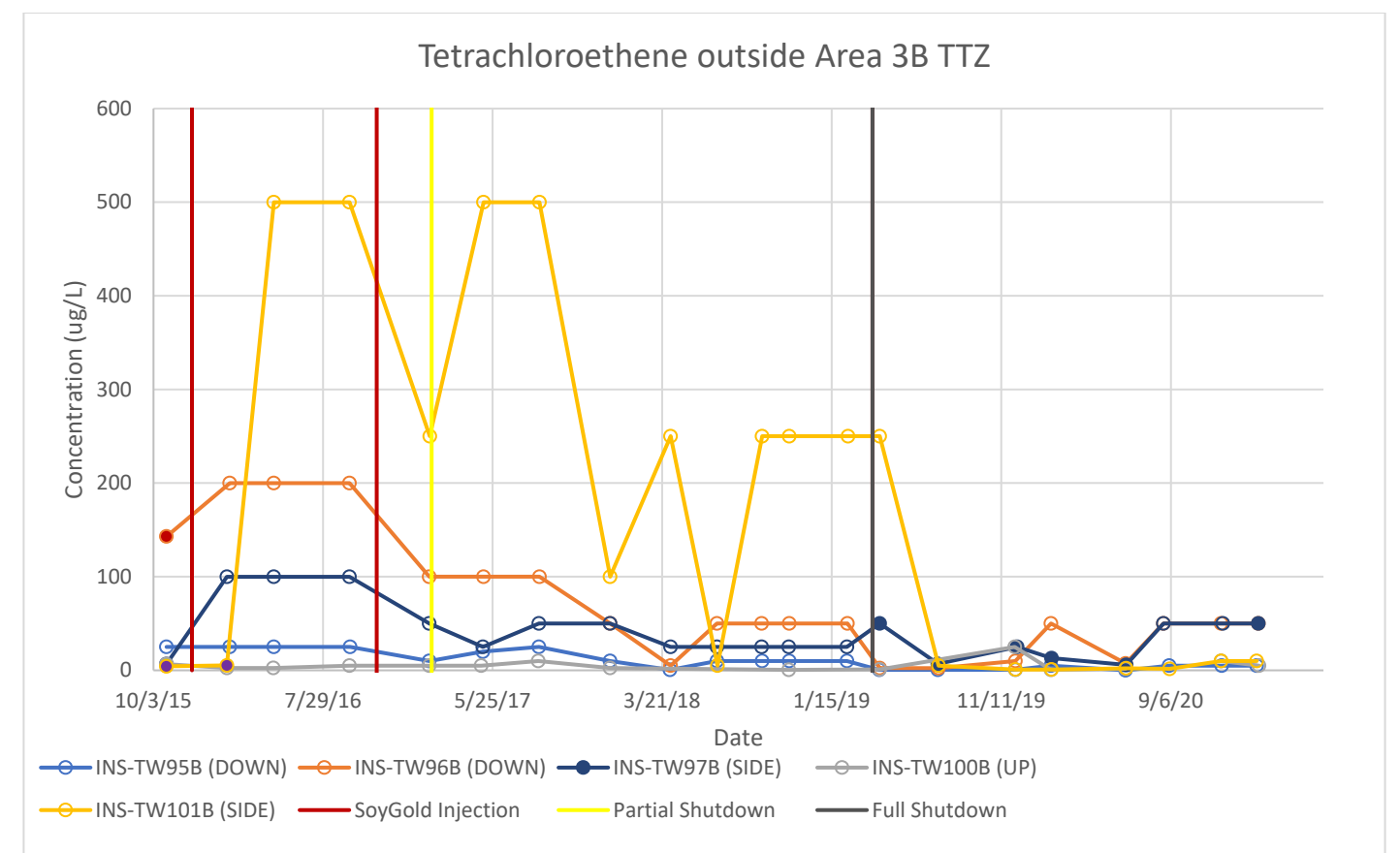
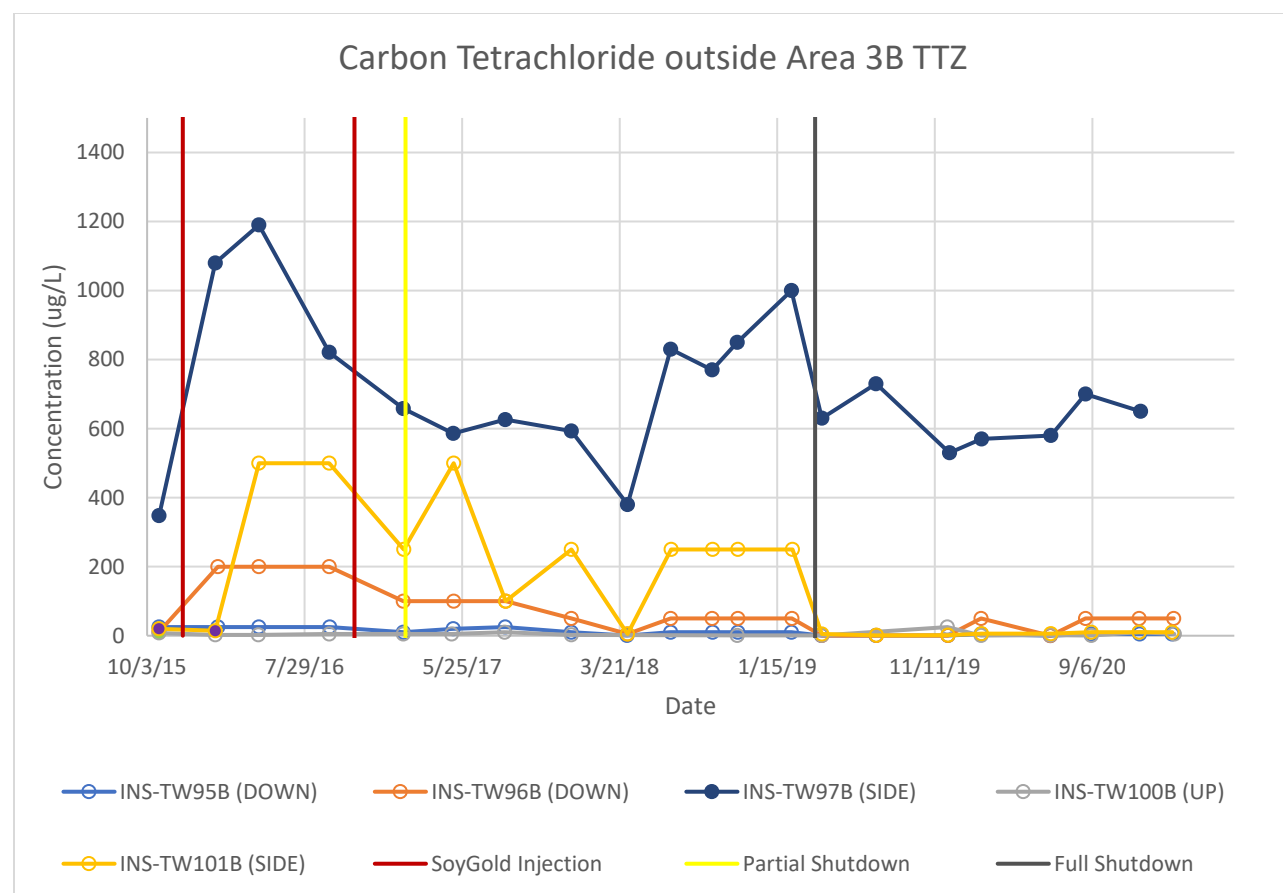
Notes:
 TTZ = target treatment zone
 DOWN = down-gradient
 SIDE = side-gradient
 UP = upgradient
 µg/L = microgram(s) per liter
 Open circles = result non-detect

Figure 5. Trend Graphs for Constituents of Concern Outside Area 3A Target Treatment Zone
 2020 Operation, Maintenance, and Monitoring Activities Memorandum
 UCC Institute Facility, Institute, West Virginia



Notes:
TTZ = target treatment zone
µg/L = microgram(s) per liter
Open circles = result non-detect

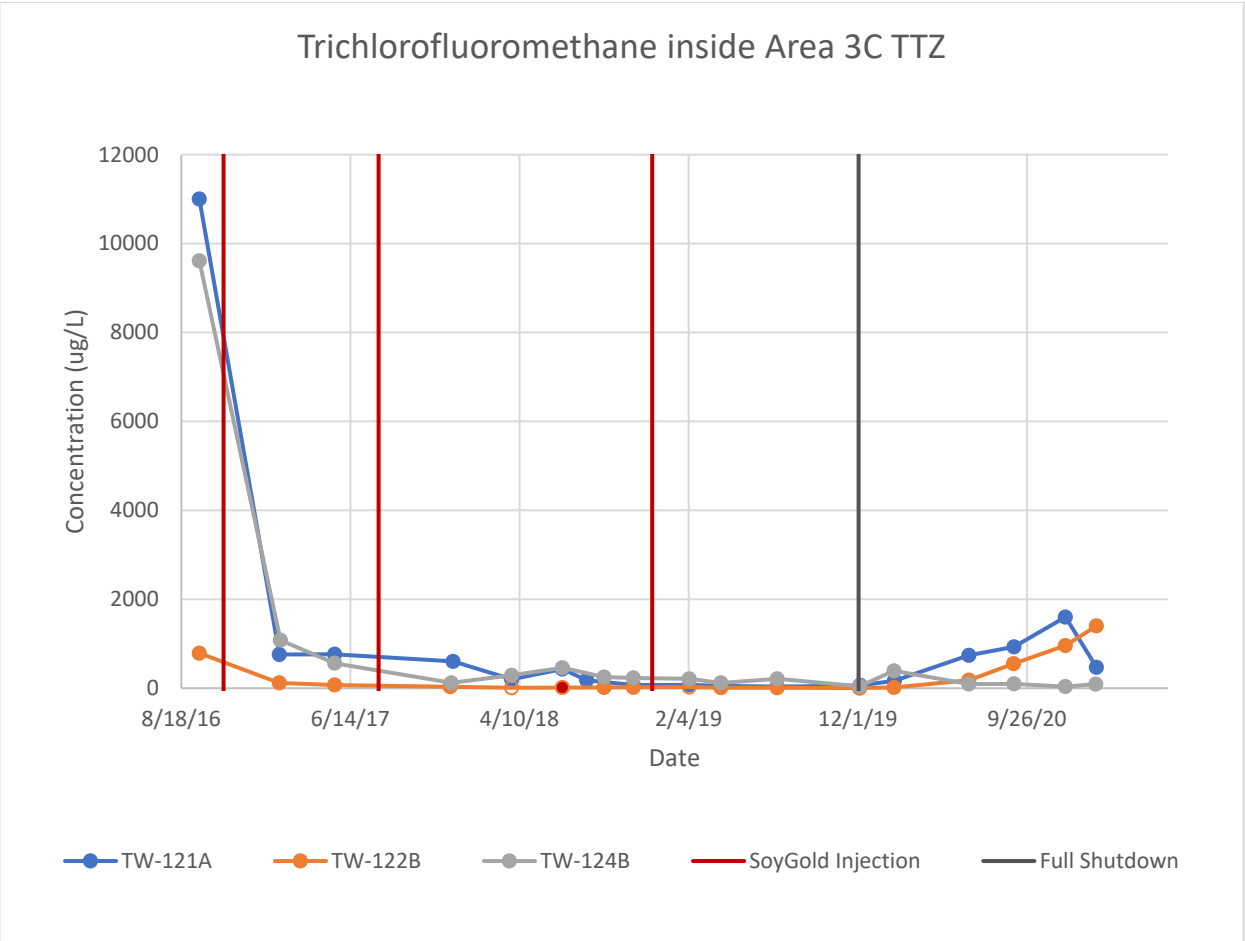
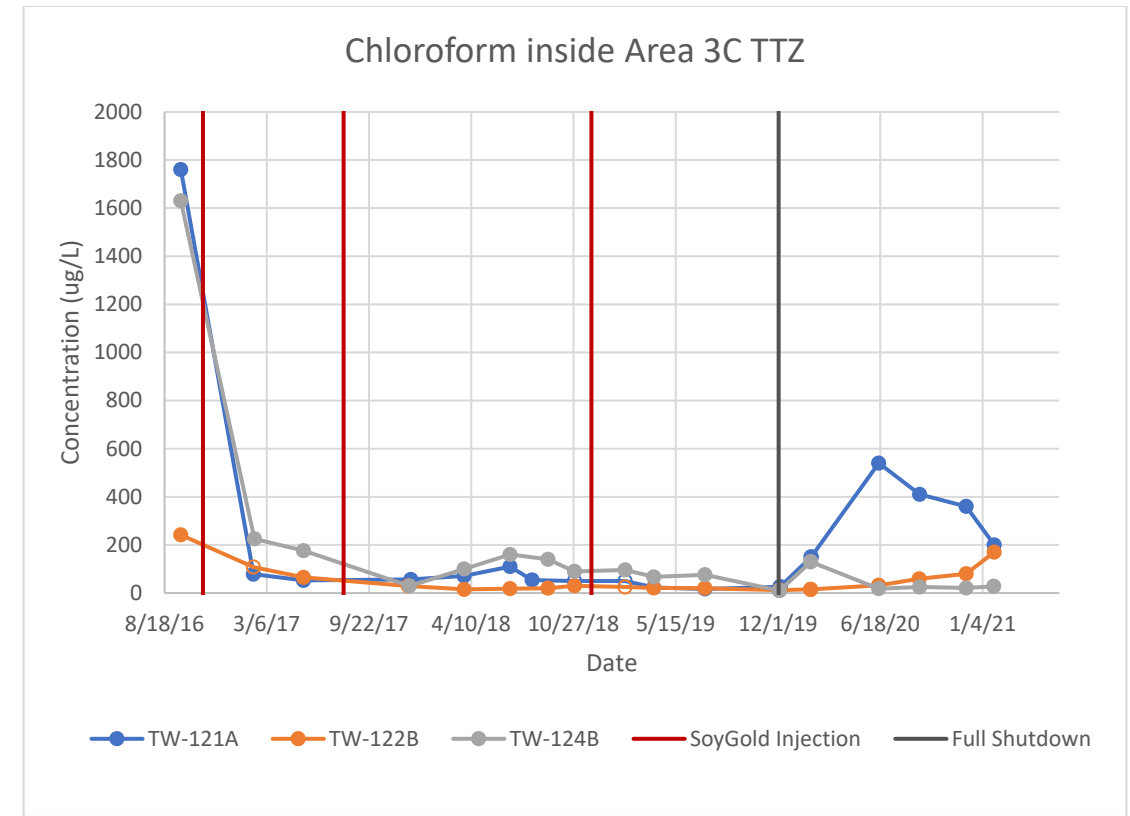
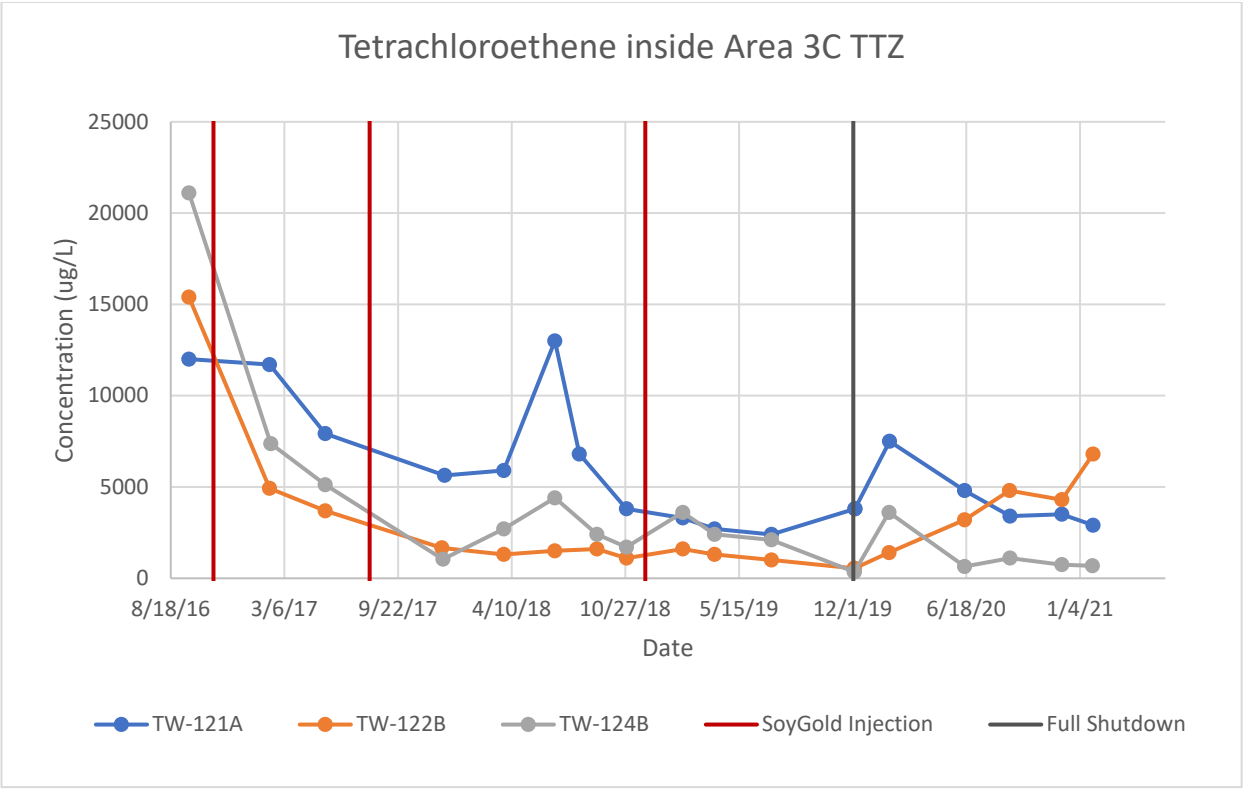
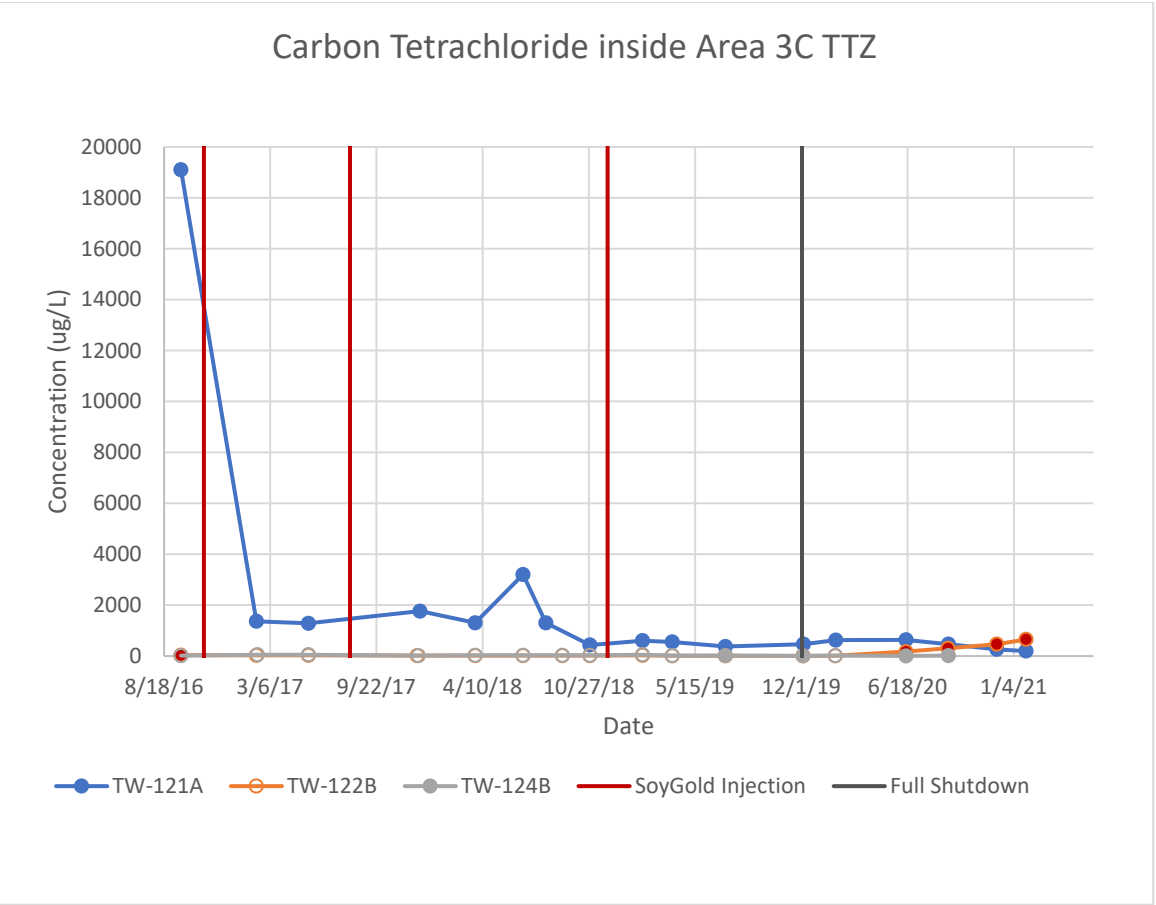
Figure 6. Trend Graphs for Constituents of Concern Inside Area 3B Target Treatment Zone
2020 Operation, Maintenance, and Monitoring Activities Memorandum
UCC Institute Facility, Institute, West Virginia



Notes:

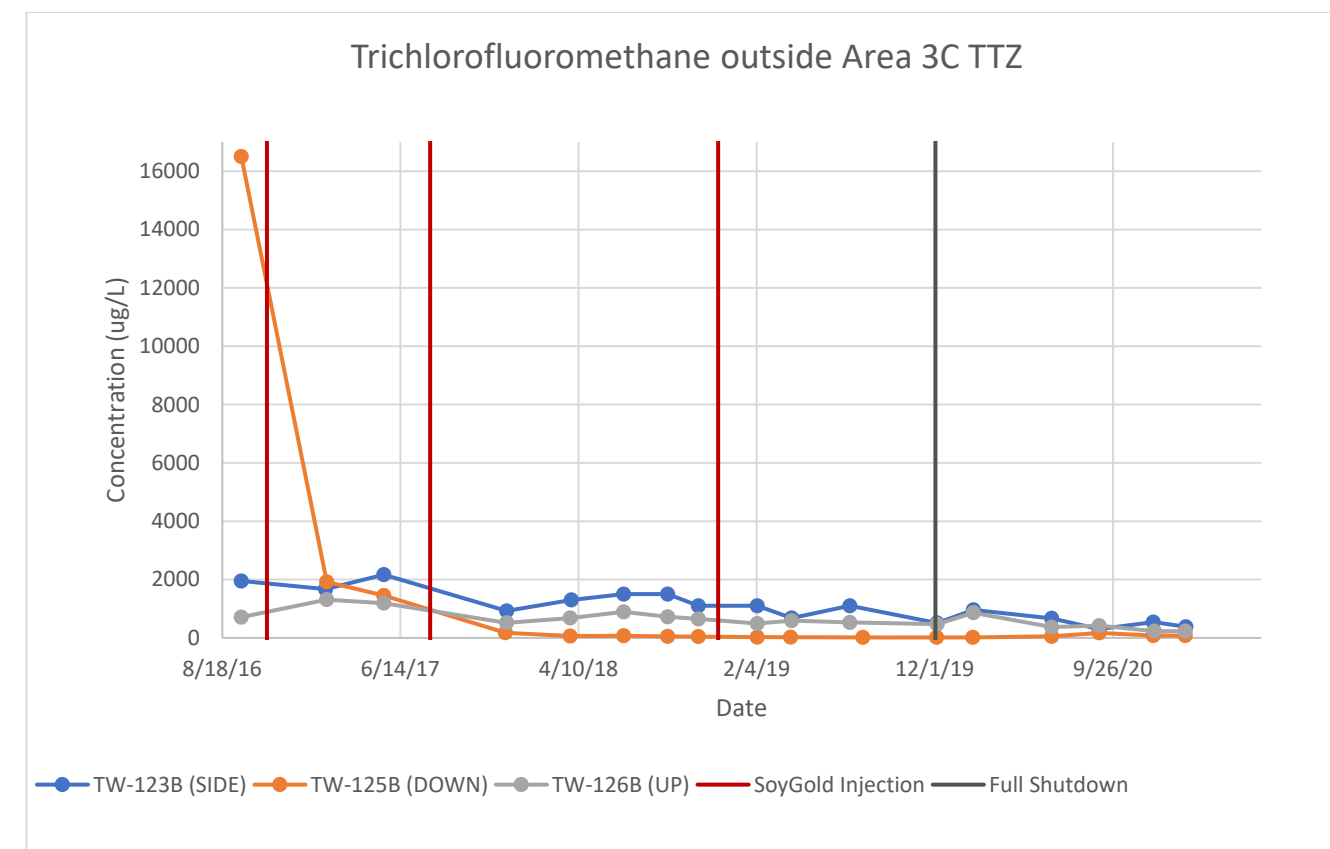
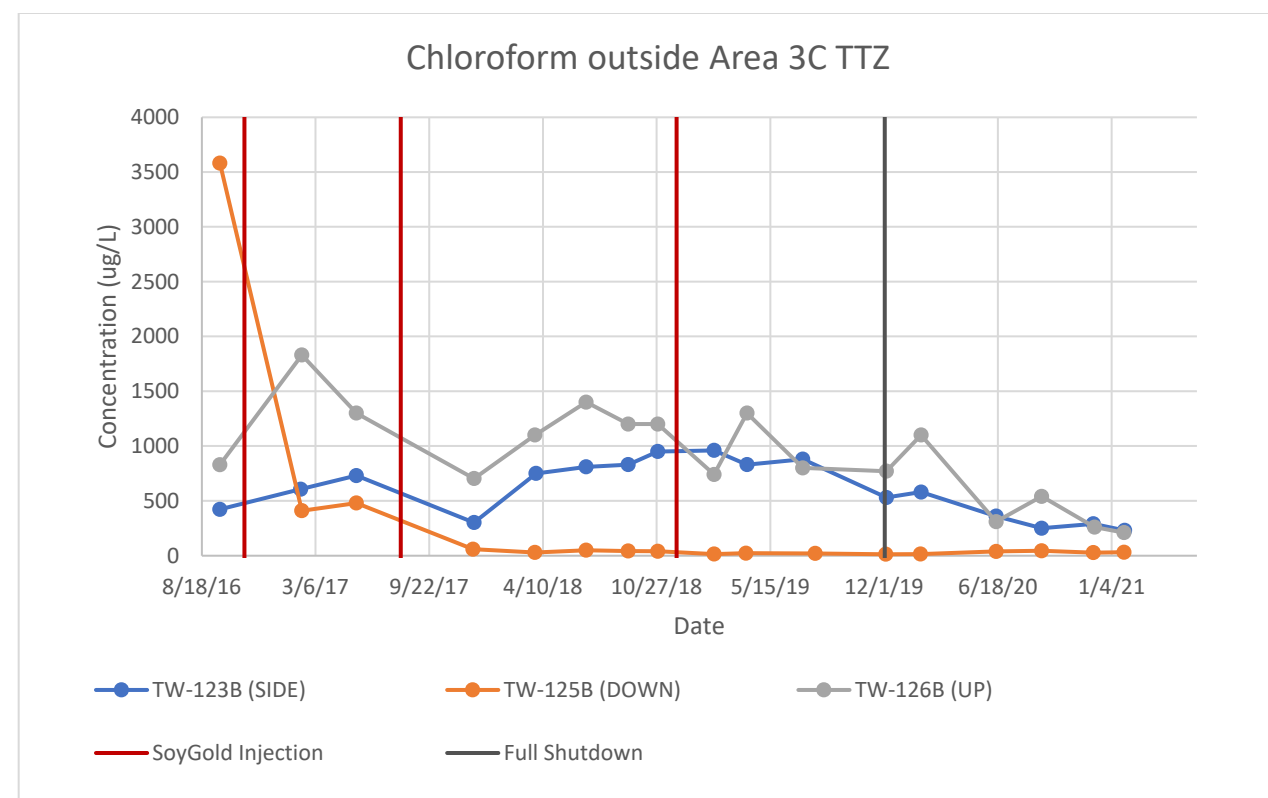
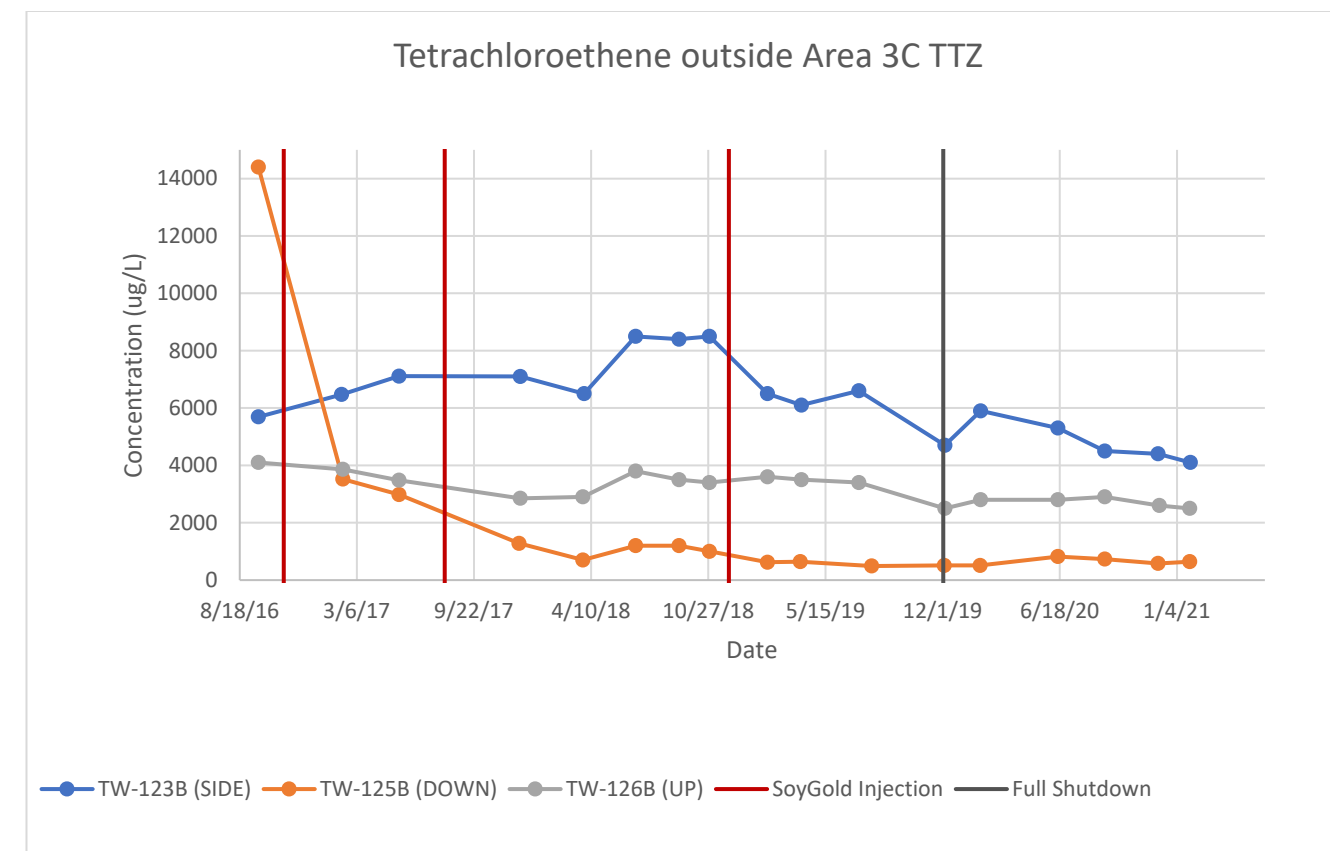
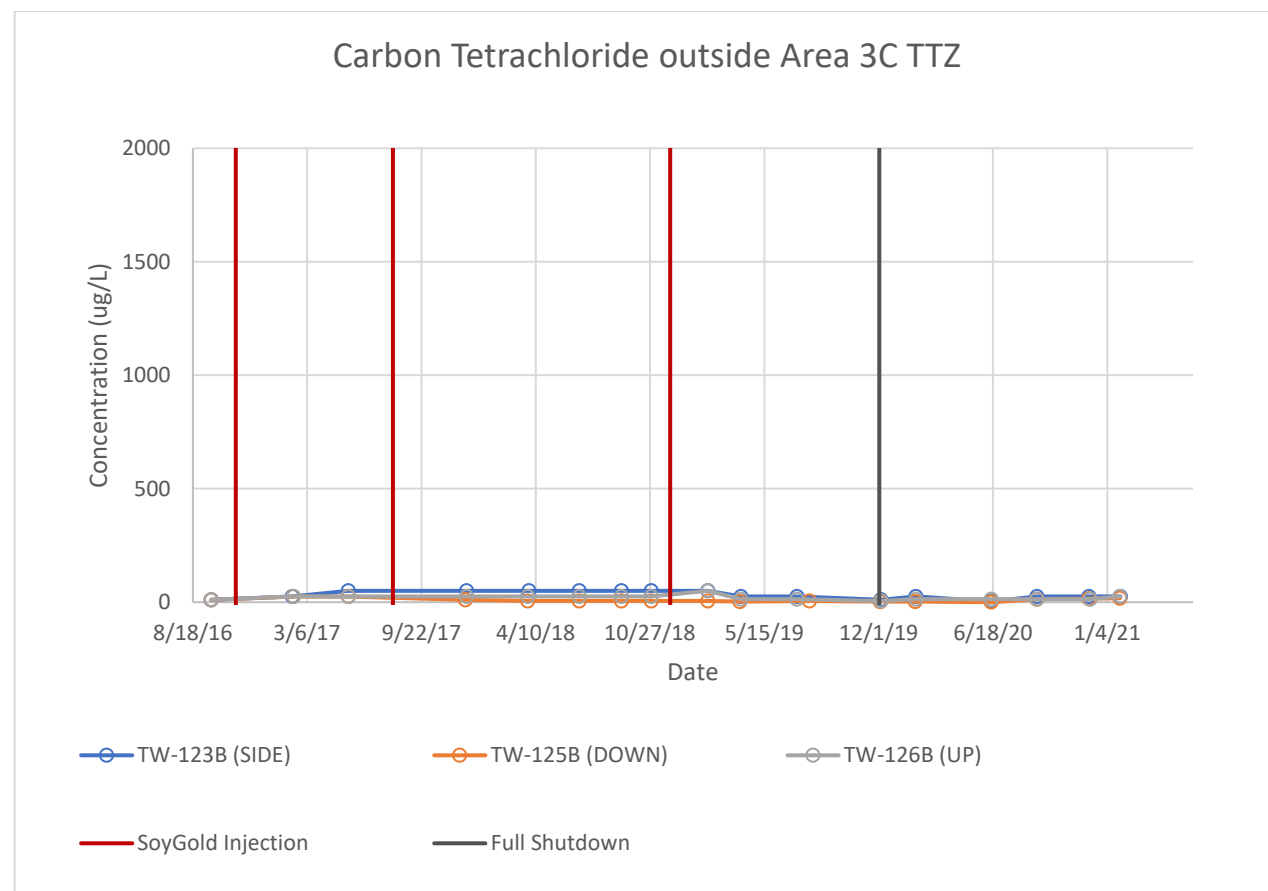
TTZ = target treatment zone	UP = upgradient
DOWN = down-gradient	µg/L = microgram(s) per liter
SIDE = side-gradient	Open circles = result non-detect

Figure 7. Trend Graphs for Constituents of Concern Outside Area 3B Target Treatment Zone
 2020 Operation, Maintenance, and Monitoring Activities Memorandum
 UCC Institute Facility, Institute, West Virginia



Notes:
TTZ = target treatment zone Open circles = result non-detect
µg/L = microgram(s) per liter

Figure 8. Trend Graphs for Constituents of Concern Inside Area 3C Target Treatment Zone
2020 Operation, Maintenance, and Monitoring Activities Memorandum
UCC Institute Facility, Institute, West Virginia



Notes:

TTZ = target treatment zone
 DOWN = down-gradient
 SIDE = side-gradient
 UP = upgradient
 ug/L = microgram(s) per liter
 Open circles = result non-detect

Figure 9. Trend Graphs for Constituents of Concern Outside Area 3C Target Treatment Zone
 2020 Operation, Maintenance, and Monitoring Activities Memorandum
 UCC Institute Facility, Institute, West Virginia

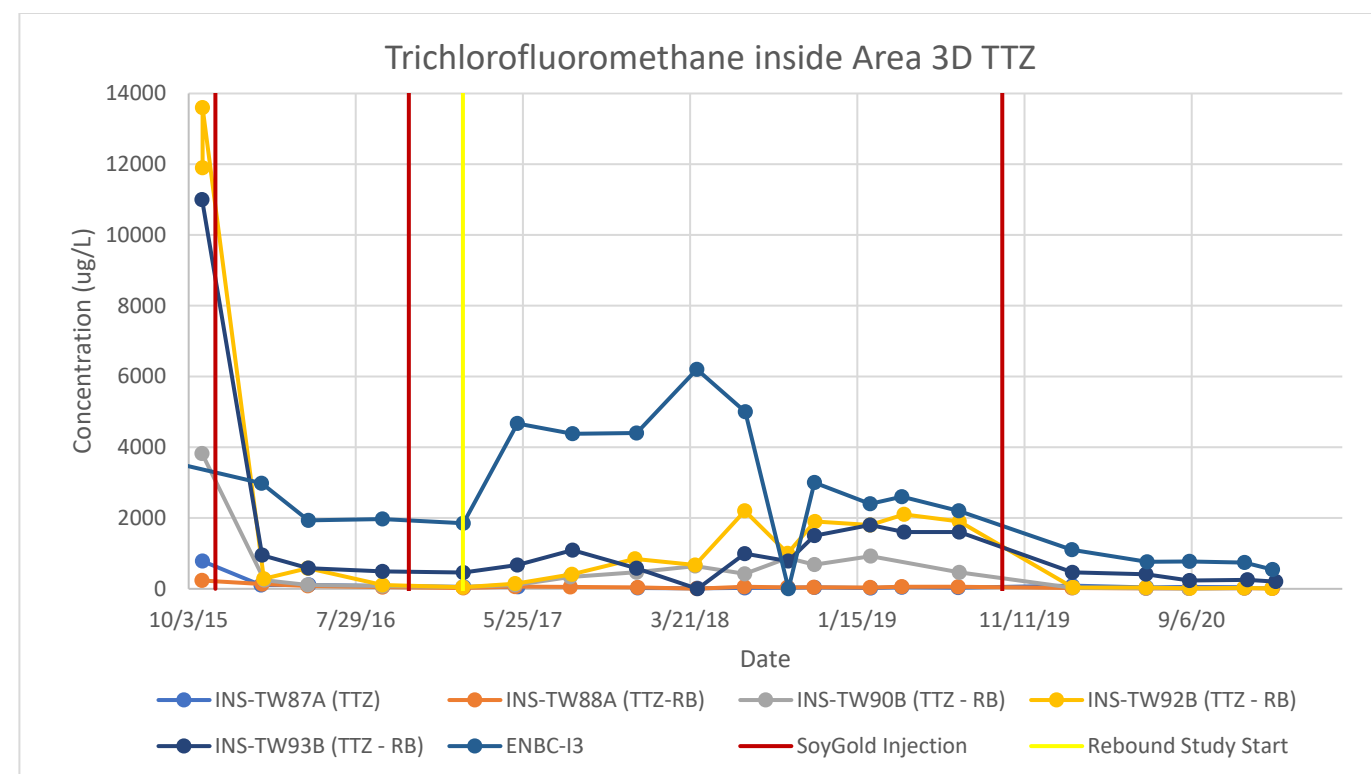
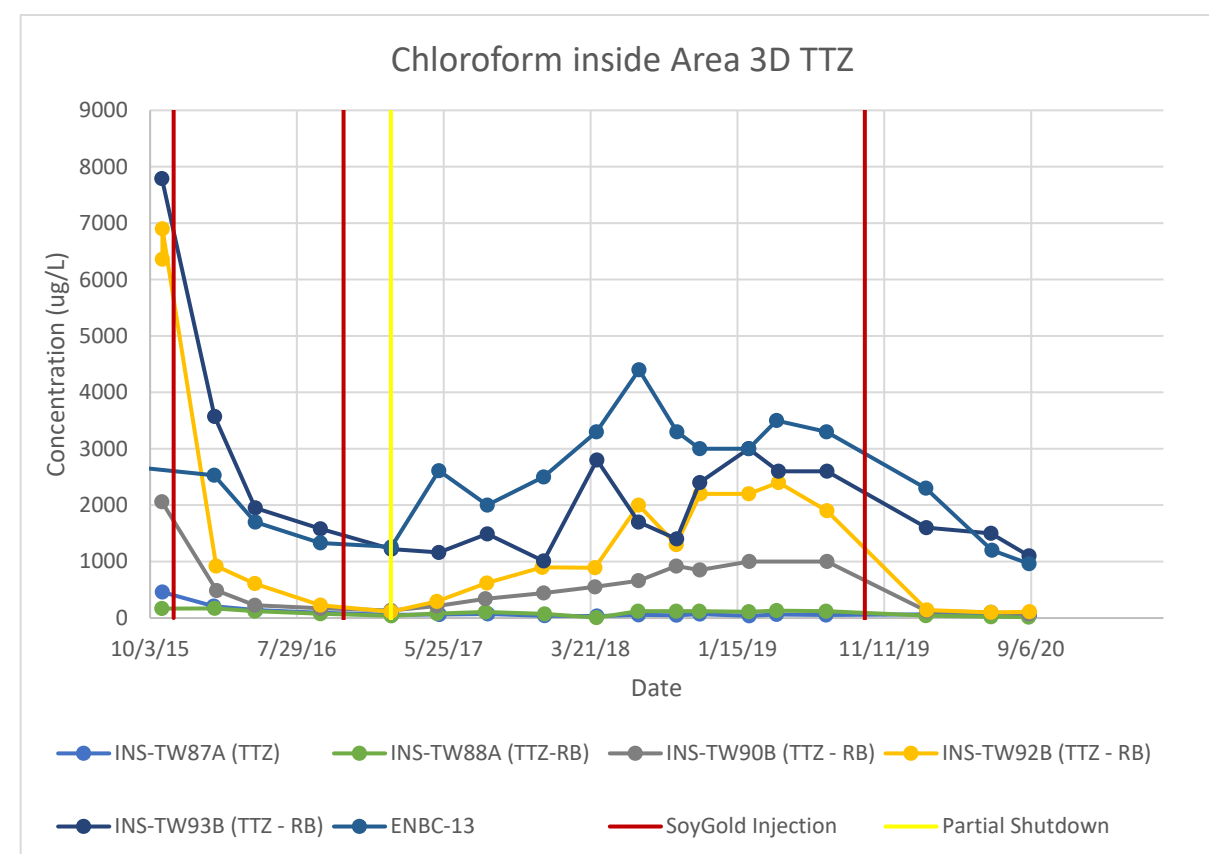
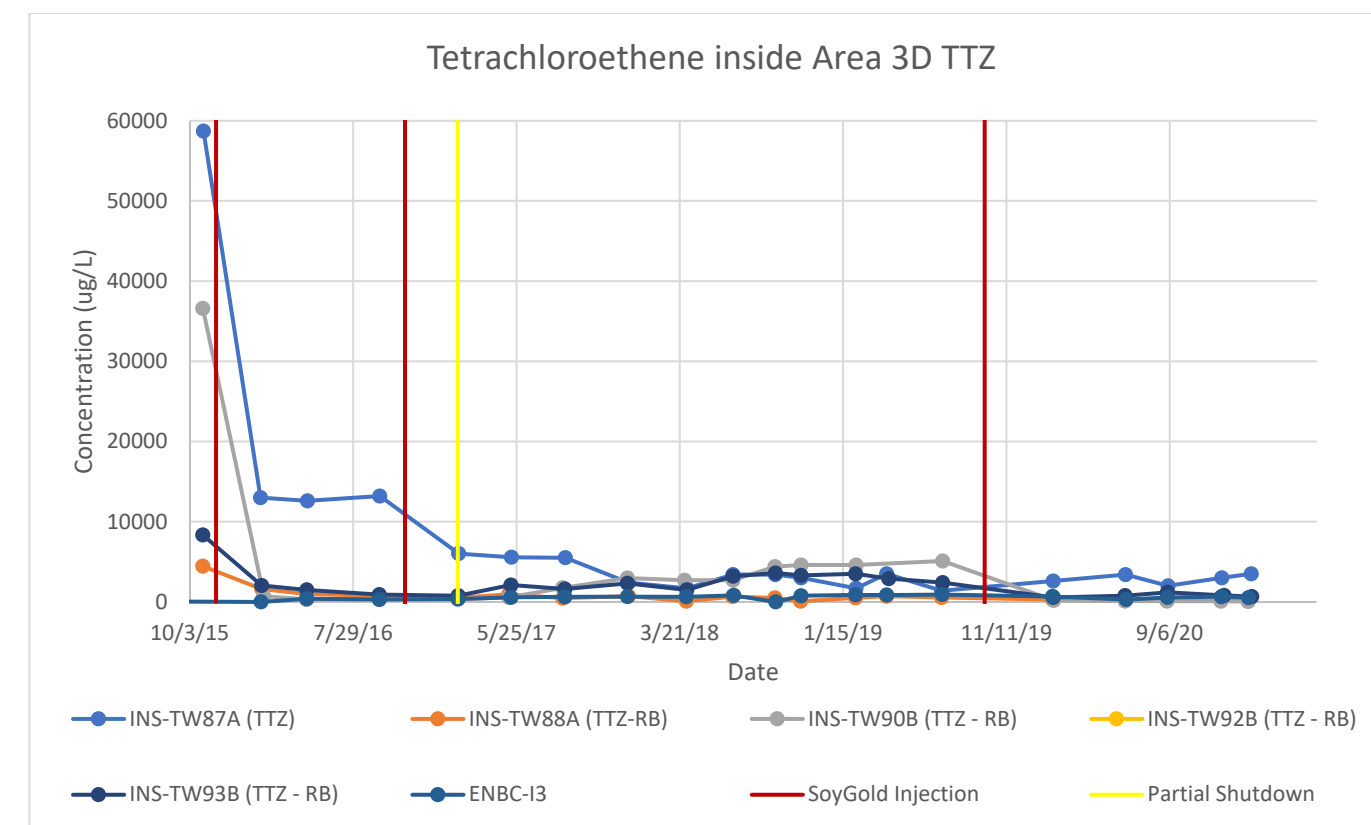
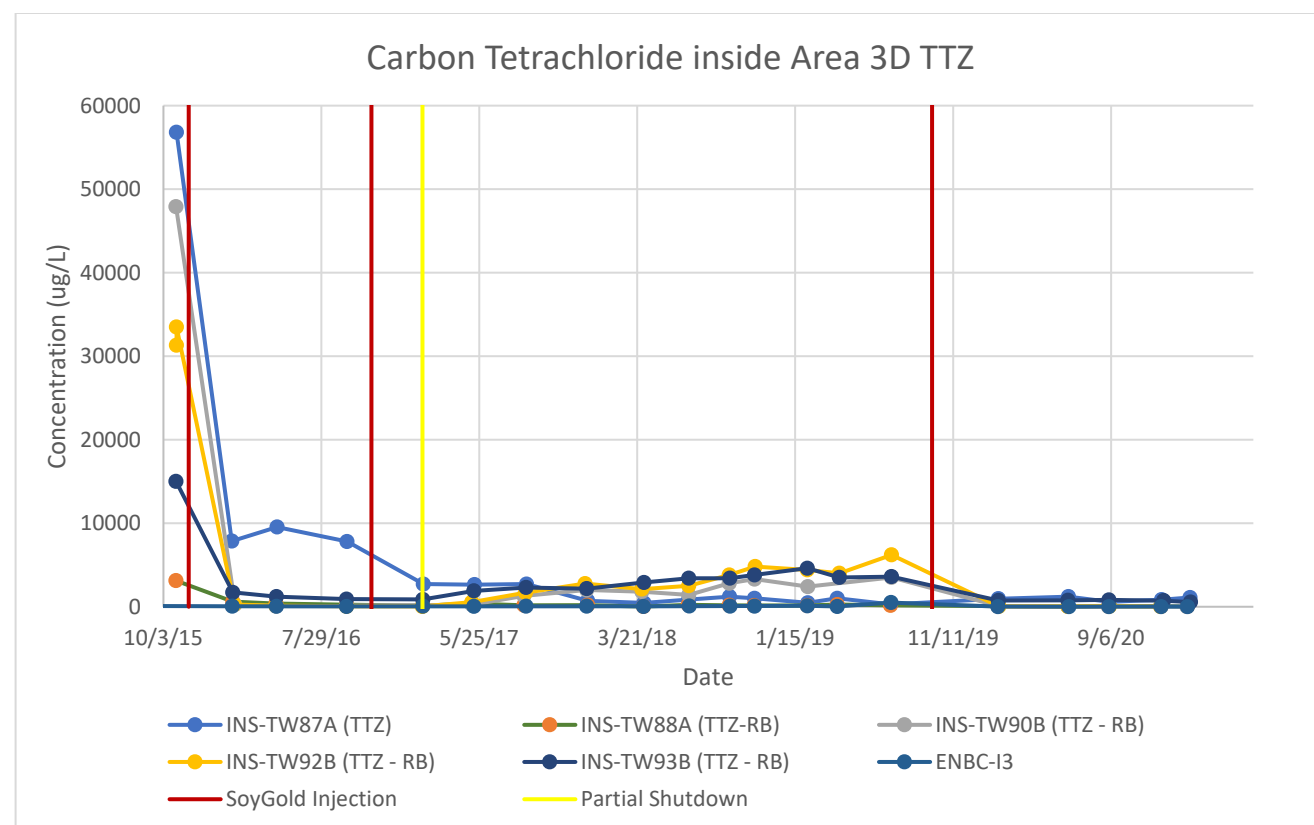
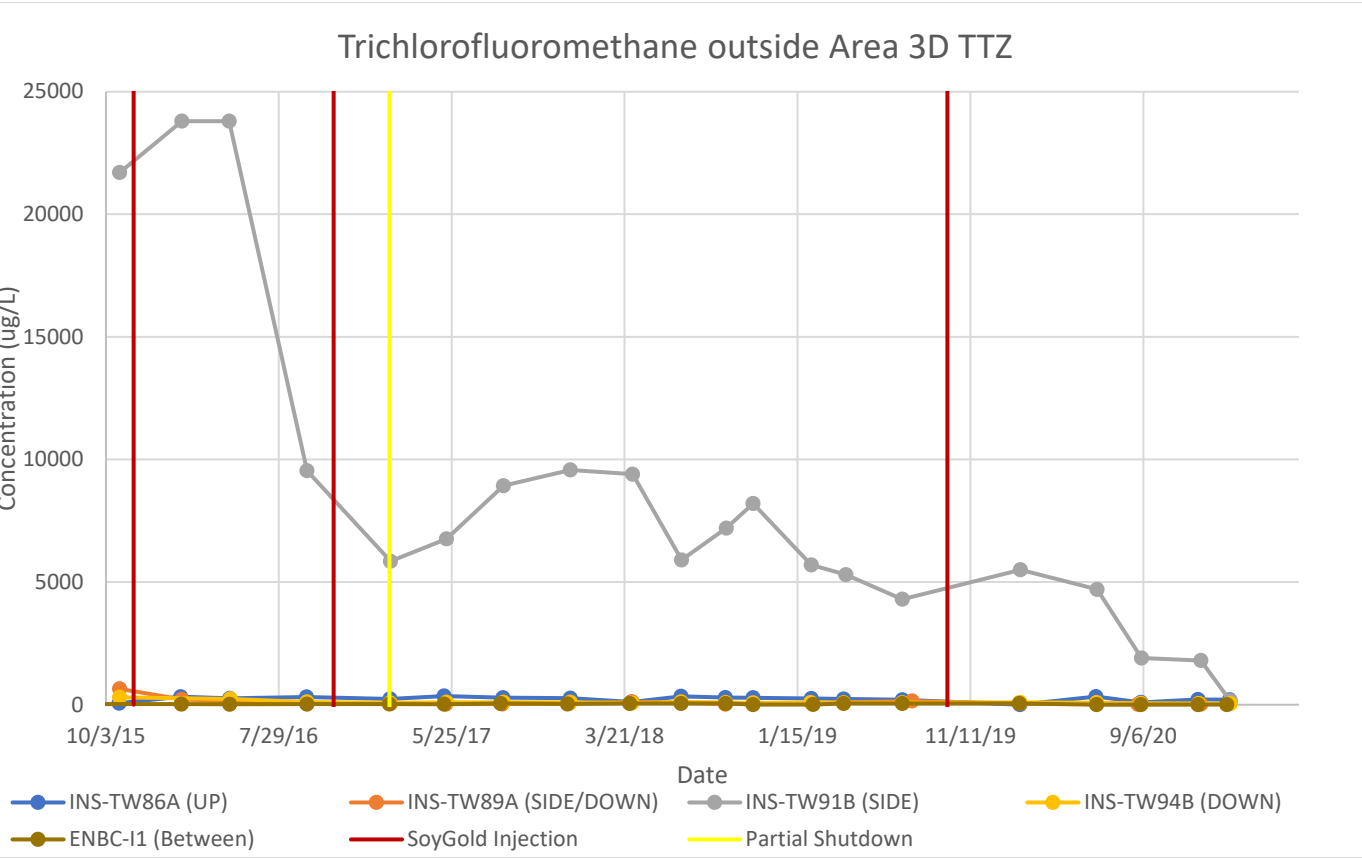
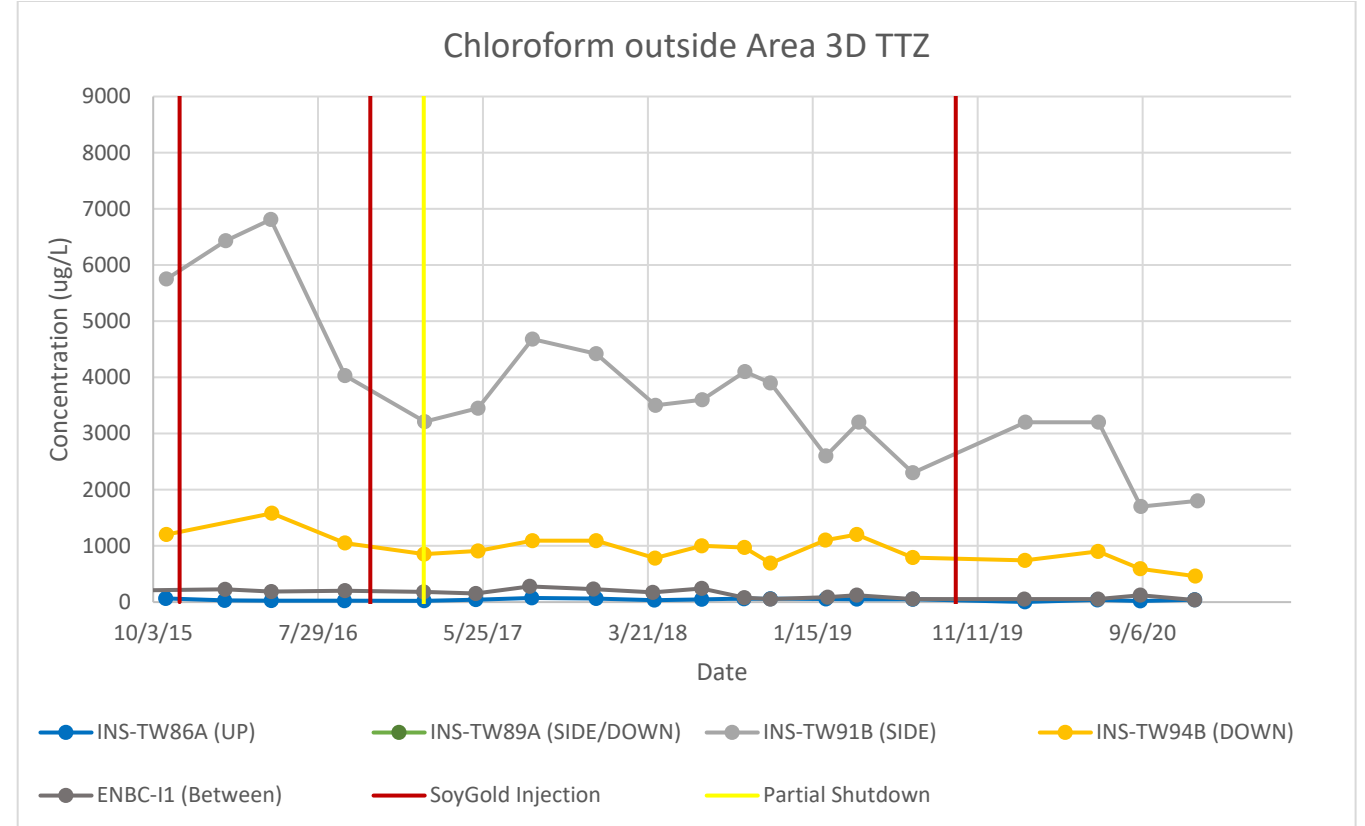
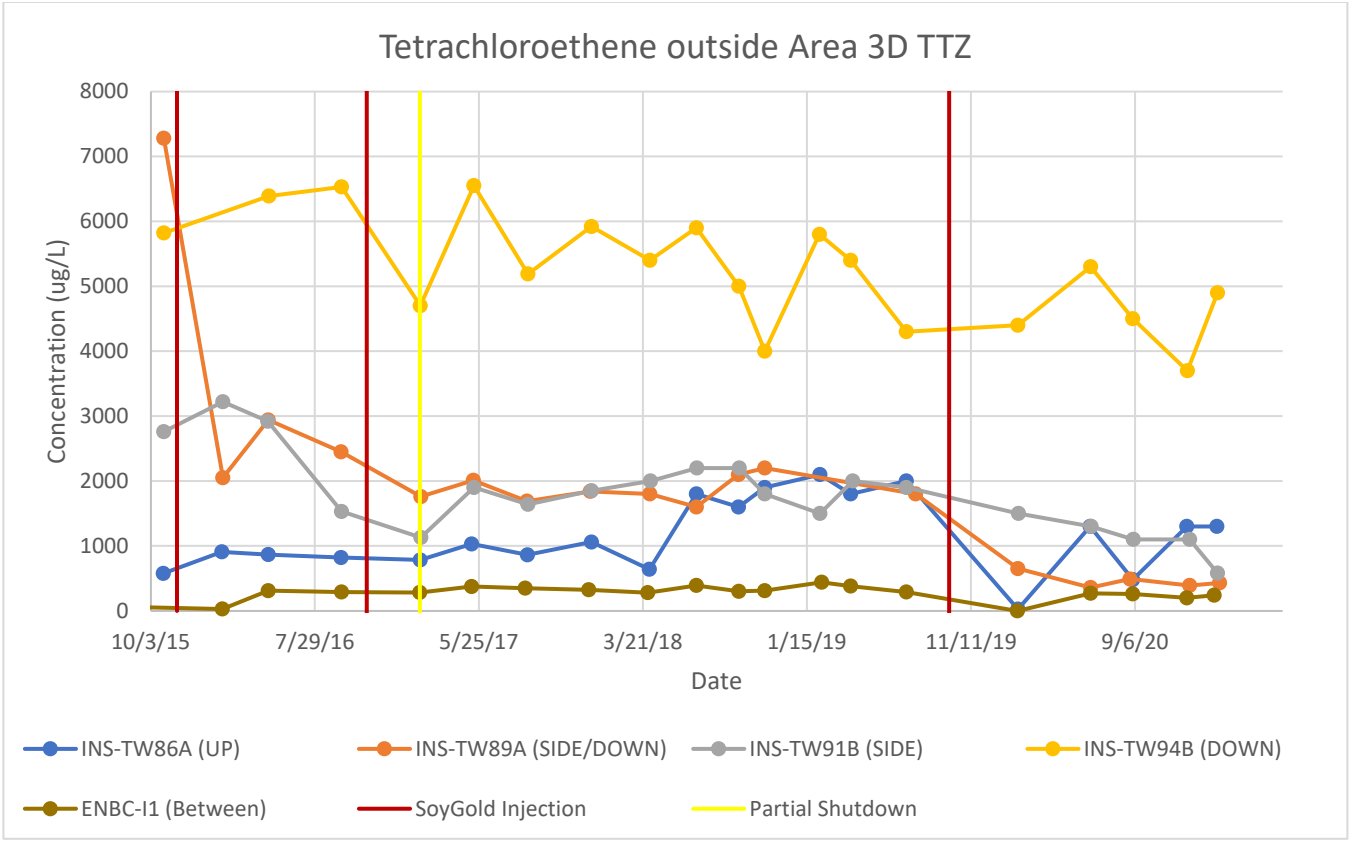
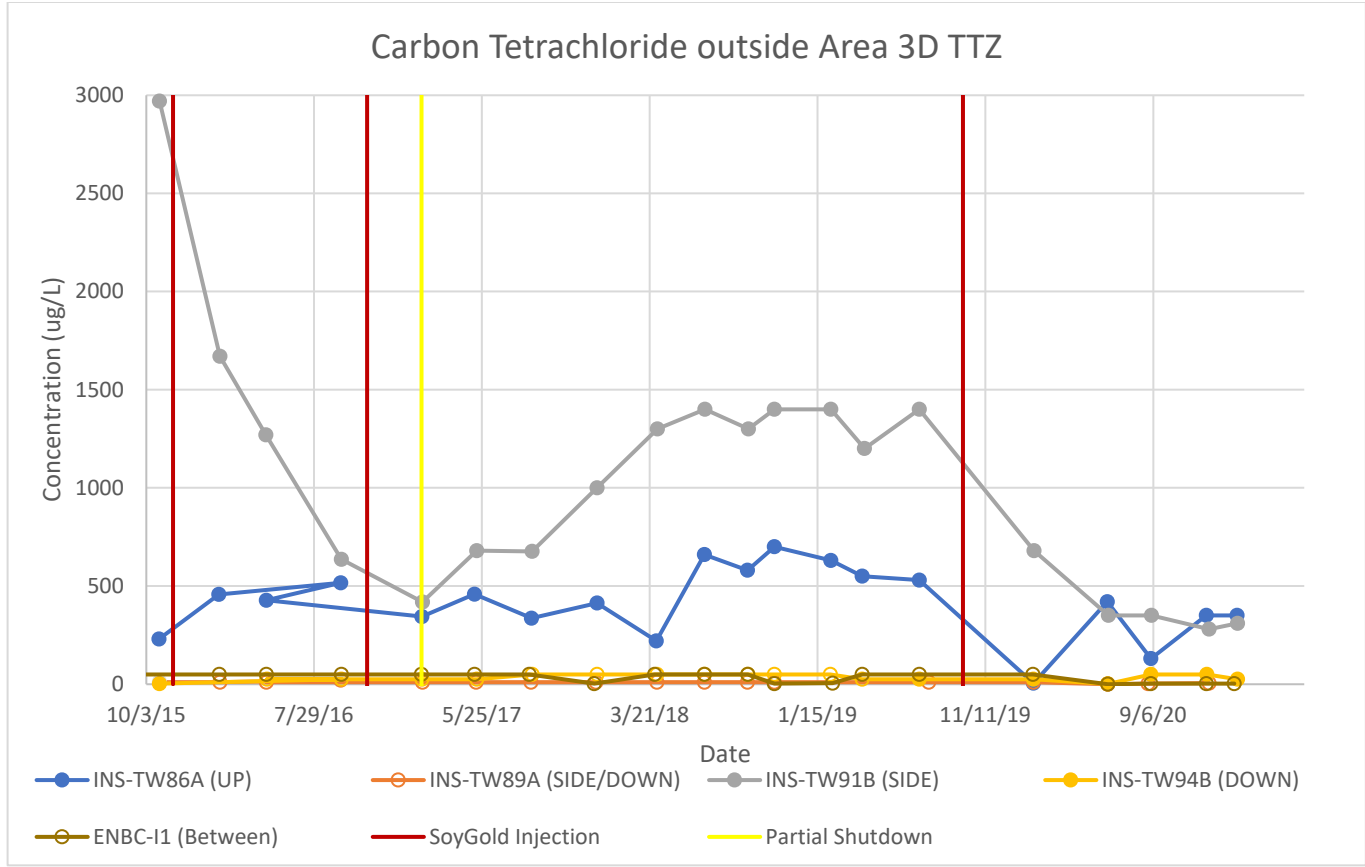


Figure 10. Trend Graphs for Constituents of Concern Inside Area 3D Target Treatment Zone
 2020 Operation, Maintenance, and Monitoring Activities Memorandum
 UCC Institute Facility, Institute, West Virginia

Notes:
 TTZ = target treatment zone
 µg/L = microgram(s) per liter



Notes:

TTZ	=	target treatment zone	UP	=	upgradient
DOWN	=	down-gradient	µg/L	=	microgram(s) per liter
SIDE	=	side-gradient	Open circles	=	result non-detect
Between	=	well between plumes			

Figure 11. Trend Graphs for Constituents of Concern Outside Area 3D Target
2020 Operation, Maintenance, and Monitoring Activities Memorandum
UCC Institute Facility, Institute, West Virginia

Attachment 1

Inspections

Union Carbide Corporation (UCC) Institute Facility – Annual Inspection Checklist

Inspection Date: 12 / 22 / 2020

Inspector Name: GREGG SMITH

1. Institutional Controls

The following questions will be completed after a driving and/or walking survey of the UCC Institute Facility and affected offsite properties has been completed.

1.1 UCC Institute Facility

Do West Virginia Department of Health and Human Resources records indicate potable wells have been constructed at the facility?

Yes ☐ No ☒

Is there evidence of potable water wells at the facility?

Yes ☐ No ☒

Are there new occupied structures at the facility? If so, indicate in the notes if a vapor control system was installed in the structure by properly trained and appropriately licensed personnel.

Yes ☐ No ☒

Is the facility being used for nonconforming purposes (e.g., residential use)?

Yes ☐ No ☒

Is there evidence of recent earthmoving activities in the areas with subsurface work restrictions (SWMU 1, 2 & 6, 11, WWTU, and Tank 1010)? If so, determine if the subsurface work was completed in accordance with the Materials Management Plan.

Yes ☒ No ☐

Notes: WORK COMPLETED ON SWMU 11 DRAIN WITH

ACCORDANCE TO MATERIALS MANAGEMENT PLAN

Do wells have concrete surface aprons adequate so that the well samples are not impacted by surface water?

Yes ☒ No ☐

Notes: _____

Is there damage to the protective casing?

Yes ☐ No ☒

Notes: _____

Are wells secured by locking? Yes ☒ No ☐

Notes: _____

3. Corrective Actions Completed

Notes: NONE

1.2 Offsite Affected Properties

Do West Virginia Department of Health and Human Resources records indicate potable wells have been constructed at the Appalachian Power Company or the portions of the Norfolk Southern or West Virginia properties subject to groundwater use restrictions (Figure 1-8)?

Yes ☐ No ☒ Not Applicable ☐

Is there evidence of potable water wells at the Appalachian Power Company or the portions of the Norfolk Southern or West Virginia State University properties subject to groundwater use restrictions (Figure 1-8)?

Yes ☐ No ☐ Not Applicable ☒

Are there new occupied structures at the Norfolk Southern property, or new residential occupied structures at the West Virginia State University property? If so, indicate in the notes if a vapor control system was installed in the structure by properly trained and appropriately licensed personnel.

Yes ☐ No ☐ Not Applicable ☒

Is the Norfolk Southern property being used for nonconforming purposes (e.g., residential use)?

Yes ☐ No ☐ Not Applicable ☒

Notes: NONE

2. Sitewide Groundwater Monitoring Wells

Is there damage to the protective bollards for the wells?

Yes ☐ No ☒

Notes:

Are wells made visible by painting and numbering? Yes ☒ No ☐

Notes:

Union Carbide Corporation Institute Facility – Quarterly Inspection Checklist

Inspection Date: MARCH 18 / 2020

Inspector Name: GREGG SMITH

1. SWMU 1 Cover

Warnings signs in place?

Yes ☒ No ☐

Gates closed and locked?

Yes ☒ No ☐

Perimeter fence intact and functioning as intended?

Yes ☒ No ☐

Evidence of subsidence or settlement?

Yes ☐ No ☒

Gravel cover in place?

Yes ☒ No ☐

Evidence of deterioration of cover?

Yes ☐ No ☒

Evidence of erosion damage?

Yes ☐ No ☒

Are there woody plants that need to be removed?

Yes ☐ No ☒

Are tar accumulations present at the ground surface near or outside the fence?

Yes ☐ No ☒

Notes: _____

2. SWMU 2 & 6 Soil Cover

Evidence of subsidence or settlement?

Yes ☐ No ☒

Evidence of furrow, ruts, or animal burrows?

Yes ☐ No ☒

Evidence of erosion damage?

Yes ☐ No ☒

Evidence of deterioration of cover?

Yes ☐ No ☒

Vegetative cover in place?

Yes ☒ No ☐

Is the grass overgrown?

Yes ☐ No ☒

New growth of woody plants that need to be removed?

Yes ☐ No ☒

Evidence of water ponding on the surface?

Yes ☐ No ☒

Notes: _____

3. SWMU 11 Soil Cover

Evidence of subsidence or settlement?

Yes ☐ No ☒

Evidence of furrow, ruts, or animal burrows?

Yes ☐ No ☒

Evidence of erosion damage?

Yes ☐ No ☒

Evidence of deterioration of cover?

Yes ☐ No ☒

Vegetative cover in place?

Yes ☒ No ☐

Is the grass overgrown?

Yes ☐ No ☒

Are there woody plants that need to be removed?

Yes ☐ No ☒

Evidence of water ponding on the surface?

Yes ☐ No ☒

Is the surface drain in the southwestern corner clear of debris and functioning as intended?

Yes ☒ No ☐

Notes: _____

4. No. 1 Sludge Pond Soil Cover

Evidence of subsidence or settlement?

Yes ☐ No ☒

Evidence of furrow, ruts, or animal burrows?

Yes ☐ No ☒

Evidence of erosion damage?

Yes ☐ No ☒

Evidence of deterioration of cover?

Yes ☐ No ☒

Vegetative cover in place?

Yes ☒ No ☐

Is the grass overgrown?

Yes ☐ No ☒

Are there woody plants that need to be removed?

Yes ☐ No ☒

Evidence of water ponding on the surface?

Yes ☐ No ☒

Are there any deficiencies in the gravel roadway such that buried waste could be exposed?

Yes ☐ No ☒

Notes: _____

5. No. 2 Sludge Pond Soil Cover

Evidence of subsidence or settlement?

Yes ☐ No ☒

Evidence of furrow, ruts, or animal burrows?

Yes ☐ No ☒

Evidence of erosion damage?

Yes ☐ No ☒

Evidence of deterioration of cover?

Yes ☐ No ☒

Vegetative cover in place?

Yes ☒ No ☐

Is the grass overgrown?

Yes ☐ No ☒

Are there woody plants that need to be removed?

Yes ☐ No ☒

Evidence of water ponding on the surface?

Yes ☐ No ☒

Is the rip rap along the perimeter in place and functioning as intended? **YES**

Notes: _____

6. No. 3 Sludge Pond Soil Cover

Evidence of subsidence or settlement?

Yes ☐ No ☒

Evidence of furrow, ruts, or animal burrows?

Yes ☐ No ☒

Evidence of erosion damage?

Yes ☐ No ☒

Evidence of deterioration of cover?

Yes ☐ No ☒

Vegetative cover in place?

Yes ☒ No ☐

Is the grass overgrown?

Yes ☐ No ☒

Are there woody plants that need to be removed?

Yes ☐ No ☒

Evidence of water ponding on the surface?

Yes ☐ No ☒

Notes: _____

7. Former Biobasin No. 1 Cover

Evidence of subsidence or settlement?

Yes ☐ No ☒

Evidence of furrow, ruts, or animal burrows?

Yes ☐ No ☒

Evidence of erosion damage?

Yes ☐ No ☒

Evidence of deterioration of cover?

Yes ☐ No ☒

Vegetative cover in place?

Yes ☒ No ☐

Is the grass overgrown?

Yes ☐ No ☒

Are there woody plants that need to be removed?

Yes ☐ No ☒

Evidence of water ponding on the surface?

Yes ☐ No ☒

Notes: _____

8. Former Biobasin No. 2 Cover

Evidence of subsidence or settlement?

Yes ☐ No ☒

Evidence of furrow, ruts, or animal burrows?

Yes ☐ No ☒

Evidence of erosion damage?

Yes ☐ No ☒

Evidence of deterioration of cover?

Yes ☐ No ☒

Vegetative cover in place?

Yes ☒ No ☐

Is the grass overgrown?

Yes ☐ No ☒

Are there woody plants that need to be removed?

Yes ☐ No ☒

Evidence of water ponding on the surface?

Yes ☐ No ☒

Notes: _____

9. Former Biobasin No. 3 Soil Cover

Evidence of subsidence or settlement?

Yes ☐ No ☒

Evidence of furrow, ruts, or animal burrows?

Yes ☐ No ☒

Evidence of erosion damage?

Yes ☐ No ☒

Evidence of deterioration of cover?

Yes ☐ No ☒

Vegetative cover in place?

Yes ☒ No ☐

Is the grass overgrown?

Yes ☐ No ☒

Are there woody plants that need to be removed?

Yes ☐ No ☒

Evidence of water ponding on the surface?

Yes ☐ No ☒

Notes: _____

10. Former Panic Pond Area Soil Cover

Evidence of subsidence or settlement?

Yes ☐ No ☒

Evidence of furrow, ruts, or animal burrows?

Yes ☐ No ☒

Evidence of erosion damage?

Yes ☐ No ☒

Evidence of deterioration of cover?

Yes ☐ No ☒

Vegetative cover in place?

Yes ☒ No ☐

Is the grass overgrown?

Yes ☐ No ☒

Are there woody plants that need to be removed?

Yes ☐ No ☒

Evidence of water ponding on the surface?

Yes ☐ No ☒

Is the rip rap in the central area in place and functioning as intended?

Yes ☒ No ☐

Is there damage to the concrete or WWTU infrastructure in the western area such that buried waste could be exposed?

Yes ☐ No ☒

Notes: _____

11. Former Equalization Basin

Is there damage to the concrete or WWTU infrastructure such that buried waste could be exposed?

Yes ☐ No ☒

Notes: _____

12. Former Pond Soil Cover

Is there damage to the concrete or WWTU infrastructure such that buried waste could be exposed?

Yes ☐ No ☒

Notes: _____

13. Corrective Actions Completed

Notes: _____

Union Carbide Corporation Institute Facility – Quarterly Inspection Checklist

Inspection Date: JUNE / 2 / 2020

Inspector Name: G. Smith

1. SWMU 1 Cover

Warnings signs in place?

Yes ☒ No ☐

Gates closed and locked?

Yes ☒ No ☐

Perimeter fence intact and functioning as intended?

Yes ☒ No ☐

Evidence of subsidence or settlement?

Yes ☐ No ☒

Gravel cover in place?

Yes ☒ No ☐

Evidence of deterioration of cover?

Yes ☐ No ☒

Evidence of erosion damage?

Yes ☐ No ☒

Are there woody plants that need to be removed?

Yes ☐ No ☒

Are tar accumulations present at the ground surface near or outside the fence?

Yes ☐ No ☒

Notes: _____

2. SWMU 2 & 6 Soil Cover

Evidence of subsidence or settlement?

Yes ☐ No ☒

Evidence of furrow, ruts, or animal burrows?

Yes ☐ No ☒

Evidence of erosion damage?

Yes ☐ No ☒

Evidence of deterioration of cover?

Yes ☐ No ☒

Vegetative cover in place?

Yes ☒ No ☐

Is the grass overgrown?

Yes ☐ No ☒

New growth of woody plants that need to be removed?

Yes ☐ No ☒

Evidence of water ponding on the surface?

Yes ☐ No ☒

Notes: _____

3. SWMU 11 Soil Cover

Evidence of subsidence or settlement?

Yes ☐ No ☒

Evidence of furrow, ruts, or animal burrows?

Yes ☐ No ☒

Evidence of erosion damage?

Yes ☐ No ☒

Evidence of deterioration of cover?

Yes ☐ No ☒

Vegetative cover in place?

Yes ☒ No ☐

Is the grass overgrown?

Yes ☐ No ☒

Are there woody plants that need to be removed?

Yes ☐ No ☒

Evidence of water ponding on the surface?

Yes ☐ No ☒

Is the surface drain in the southwestern corner clear of debris and functioning as intended?

Yes ☒ No ☐

Notes: _____

4. No. 1 Sludge Pond Soil Cover

Evidence of subsidence or settlement?

Yes ☐ No ☒

Evidence of furrow, ruts, or animal burrows?

Yes ☐ No ☒

Evidence of erosion damage?

Yes ☐ No ☒

Evidence of deterioration of cover?

Yes ☐ No ☒

Vegetative cover in place?

Yes ☒ No ☐

Is the grass overgrown?

Yes ☐ No ☒

Are there woody plants that need to be removed?

Yes ☐ No ☒

Evidence of water ponding on the surface?

Yes ☐ No ☒

Are there any deficiencies in the gravel roadway such that buried waste could be exposed?

Yes ☐ No ☒

Notes: _____

5. No. 2 Sludge Pond Soil Cover

Evidence of subsidence or settlement?

Yes ☐ No ☒

Evidence of furrow, ruts, or animal burrows?

Yes ☐ No ☒

Evidence of erosion damage?

Yes ☐ No ☒

Evidence of deterioration of cover?

Yes ☐ No ☒

Vegetative cover in place?

Yes ☒ No ☐

Is the grass overgrown?

Yes ☐ No ☒

Are there woody plants that need to be removed?

Yes ☐ No ☒

Evidence of water ponding on the surface?

Yes ☐ No ☒

Is the rip rap along the perimeter in place and functioning as intended?

Yes ☒ No ☐

Notes: _____

6. No. 3 Sludge Pond Soil Cover

Evidence of subsidence or settlement?

Yes ☐ No ☒

Evidence of furrow, ruts, or animal burrows?

Yes ☐ No ☒

Evidence of erosion damage?

Yes ☐ No ☒

Evidence of deterioration of cover?

Yes ☐ No ☒

Vegetative cover in place?

Yes ☒ No ☐

Is the grass overgrown?

Yes ☐ No ☒

Are there woody plants that need to be removed?

Yes ☐ No ☒

Evidence of water ponding on the surface?

Yes ☐ No ☒

Notes: _____

7. Former Biobasin No. 1 Cover

Evidence of subsidence or settlement?

Yes ☐ No ☒

Evidence of furrow, ruts, or animal burrows?

Yes ☐ No ☒

Evidence of erosion damage?

Yes ☐ No ☒

Evidence of deterioration of cover?

Yes ☐ No ☒

Vegetative cover in place?

Yes ☒ No ☐

Is the grass overgrown?

Yes ☐ No ☒

Are there woody plants that need to be removed?

Yes ☐ No ☒

Evidence of water ponding on the surface?

Yes ☐ No ☒

Notes: _____

8. Former Biobasin No. 2 Cover

Evidence of subsidence or settlement?

Yes ☐ No ☒

Evidence of furrow, ruts, or animal burrows?

Yes ☐ No ☒

Evidence of erosion damage?

Yes ☐ No ☒

Evidence of deterioration of cover?

Yes ☐ No ☒

Vegetative cover in place?

Yes ☒ No ☐

Is the grass overgrown?

Yes ☐ No ☒

Are there woody plants that need to be removed?

Yes ☐ No ☒

Evidence of water ponding on the surface?

Yes ☐ No ☒

Notes: _____

9. Former Biobasin No. 3 Soil Cover

Evidence of subsidence or settlement?

Yes ☐ No ☒

Evidence of furrow, ruts, or animal burrows?

Yes ☐ No ☒

Evidence of erosion damage?

Yes ☐ No ☒

Evidence of deterioration of cover?

Yes ☐ No ☒

Vegetative cover in place?

Yes ☒ No ☐

Is the grass overgrown?

Yes ☐ No ☒

Are there woody plants that need to be removed?

Yes ☐ No ☒

Evidence of water ponding on the surface?

Yes ☐ No ☒

Notes: _____

10. Former Panic Pond Area Soil Cover

Evidence of subsidence or settlement?

Yes ☐ No ☒

Evidence of furrow, ruts, or animal burrows?

Yes ☐ No ☒

Evidence of erosion damage?

Yes ☐ No ☒

Evidence of deterioration of cover?

Yes ☐ No ☒

Vegetative cover in place?

Yes ☒ No ☐

Is the grass overgrown?

Yes ☐ No ☒

Are there woody plants that need to be removed?

Yes ☐ No ☒

Evidence of water ponding on the surface?

Yes ☐ No ☒

Is the rip rap in the central area in place and functioning as intended?

Yes ☒ No ☐

Is there damage to the concrete or WWTU infrastructure in the western area such that buried waste could be exposed?

Yes ☐ No ☒

Notes: _____

11. Former Equalization Basin

Is there damage to the concrete or WWTU infrastructure such that buried waste could be exposed?

Yes ☐ No ☒

Notes: _____

12. Former Pond Soil Cover

Is there damage to the concrete or WWTU infrastructure such that buried waste could be exposed?

Yes ☐ No ☒

Notes: _____

13. Corrective Actions Completed

Notes: _____

Union Carbide Corporation Institute Facility – Quarterly Inspection Checklist

Inspection Date: 09 / 30 / 2020

Inspector Name: Jeff Runyon

1. SWMU 1 Cover

Warnings signs in place?

Yes ☒ No ☐

Gates closed and locked?

Yes ☒ No ☐

Perimeter fence intact and functioning as intended?

Yes ☒ No ☐

Evidence of subsidence or settlement?

Yes ☐ No ☒

Gravel cover in place?

Yes ☒ No ☐

Evidence of deterioration of cover?

Yes ☐ No ☒

Evidence of erosion damage?

Yes ☐ No ☒

Are there woody plants that need to be removed?

Yes ☐ No ☒

Are tar accumulations present at the ground surface near or outside the fence?

Yes ☐ No ☒

Notes: _____

2. SWMU 2 & 6 Soil Cover

Evidence of subsidence or settlement?

Yes ☐ No ☒

Evidence of furrow, ruts, or animal burrows?

Yes ☐ No ☒

Evidence of erosion damage?

Yes ☐ No ☒

Evidence of deterioration of cover?

Yes ☐ No ☒

Vegetative cover in place?

Yes ☒ No ☐

Is the grass overgrown?

Yes ☐ No ☒

New growth of woody plants that need to be removed?

Yes ☐ No ☒

Evidence of water ponding on the surface?

Yes ☐ No ☒

Notes: _____

3. SWMU 11 Soil Cover

Evidence of subsidence or settlement?

Yes ☐ No ☒

Evidence of furrow, ruts, or animal burrows?

Yes ☐ No ☒

Evidence of erosion damage?

Yes ☒ No ☐

Evidence of deterioration of cover?

Yes ☐ No ☒

Vegetative cover in place?

Yes ☒ No ☐

Is the grass overgrown?

Yes ☐ No ☒

Are there woody plants that need to be removed?

Yes ☐ No ☒

Evidence of water ponding on the surface?

Yes ☐ No ☒

Is the surface drain in the southwestern corner clear of debris and functioning as intended?

Yes ☐ No ☒

Notes: The soil at the drain is eroding away and surface water is going around the drain. An estimate for repairs will be obtained and repairs to the soil will be made. Repairs were made to the drain on December 18, 2020.

4. No. 1 Sludge Pond Soil Cover

Evidence of subsidence or settlement?

Yes ☐ No ☒

Evidence of furrow, ruts, or animal burrows?

Yes ☐ No ☒

Evidence of erosion damage?

Yes ☐ No ☒

Evidence of deterioration of cover?

Yes ☐ No ☒

Vegetative cover in place?

Yes ☒ No ☐

Is the grass overgrown?

Yes ☐ No ☒

Are there woody plants that need to be removed?

Yes ☐ No ☒

Evidence of water ponding on the surface?

Yes ☐ No ☒

Are there any deficiencies in the gravel roadway such that buried waste could be exposed?

Yes ☐ No ☒

Notes: _____

5. No. 2 Sludge Pond Soil Cover

Evidence of subsidence or settlement?

Yes ☐ No ☒

Evidence of furrow, ruts, or animal burrows?

Yes ☐ No ☒

Evidence of erosion damage?

Yes ☐ No ☒

Evidence of deterioration of cover?

Yes ☐ No ☒

Vegetative cover in place?

Yes ☒ No ☐

Is the grass overgrown?

Yes ☐ No ☒

Are there woody plants that need to be removed?

Yes ☐ No ☒

Evidence of water ponding on the surface?

Yes ☐ No ☒

Is the rip rap along the perimeter in place and functioning as intended?

Yes ☒ No ☐

Notes: _____

6. No. 3 Sludge Pond Soil Cover

Evidence of subsidence or settlement?

Yes ☐ No ☒

Evidence of furrow, ruts, or animal burrows?

Yes ☐ No ☒

Evidence of erosion damage?

Yes ☐ No ☒

Evidence of deterioration of cover?

Yes ☐ No ☒

Vegetative cover in place?

Yes ☒ No ☐

Is the grass overgrown?

Yes ☐ No ☒

Are there woody plants that need to be removed?

Yes ☐ No ☒

Evidence of water ponding on the surface?

Yes ☐ No ☒

Notes: _____

7. Former Biobasin No. 1 Cover

Evidence of subsidence or settlement?

Yes ☐ No ☒

Evidence of furrow, ruts, or animal burrows?

Yes ☐ No ☒

Evidence of erosion damage?

Yes ☐ No ☒

Evidence of deterioration of cover?

Yes ☐ No ☒

Vegetative cover in place?

Yes ☒ No ☐

Is the grass overgrown?

Yes ☐ No ☒

Are there woody plants that need to be removed?

Yes ☐ No ☒

Evidence of water ponding on the surface?

Yes ☐ No ☒

Notes: _____

8. Former Biobasin No. 2 Cover

Evidence of subsidence or settlement?

Yes ☐ No ☒

Evidence of furrow, ruts, or animal burrows?

Yes ☐ No ☒

Evidence of erosion damage?

Yes ☐ No ☒

Evidence of deterioration of cover?

Yes ☐ No ☒

Vegetative cover in place?

Yes ☒ No ☐

Is the grass overgrown?

Yes ☐ No ☒

Are there woody plants that need to be removed?

Yes ☐ No ☒

Evidence of water ponding on the surface?

Yes ☐ No ☒

Notes: _____

9. Former Biobasin No. 3 Soil Cover

Evidence of subsidence or settlement?

Yes ☐ No ☒

Evidence of furrow, ruts, or animal burrows?

Yes ☐ No ☒

Evidence of erosion damage?

Yes ☐ No ☒

Evidence of deterioration of cover?

Yes ☐ No ☒

Vegetative cover in place?

Yes ☒ No ☐

Is the grass overgrown?

Yes ☐ No ☒

Are there woody plants that need to be removed?

Yes ☐ No ☒

Evidence of water ponding on the surface?

Yes ☐ No ☒

Notes: _____

10. Former Panic Pond Area Soil Cover

Evidence of subsidence or settlement?

Yes ☐ No ☒

Evidence of furrow, ruts, or animal burrows?

Yes ☐ No ☒

Evidence of erosion damage?

Yes ☐ No ☒

Evidence of deterioration of cover?

Yes ☐ No ☒

Vegetative cover in place?

Yes ☒ No ☐

Is the grass overgrown?

Yes ☐ No ☒

Are there woody plants that need to be removed?

Yes ☐ No ☒

Evidence of water ponding on the surface?

Yes ☐ No ☒

Is the rip rap in the central area in place and functioning as intended?

Yes ☒ No ☐

Is there damage to the concrete or WWTU infrastructure in the western area such that buried waste could be exposed?

Yes ☐ No ☒

Notes: _____

11. Former Equalization Basin

Is there damage to the concrete or WWTU infrastructure such that buried waste could be exposed?

Yes ☐ No ☒

Notes: _____

12. Former Pond Soil Cover

Is there damage to the concrete or WWTU infrastructure such that buried waste could be exposed?

Yes ☐ No ☒

Notes: _____

13. Corrective Actions Completed

Notes: SWMU 11 Drain was repaired. See notes on SWMU 11 inspection sheet above.

Union Carbide Corporation Institute Facility – Quarterly Inspection Checklist

Inspection Date: 12 / 22 / 2020

Inspector Name: GREGG Smith

1. SWMU 1 Cover

Warnings signs in place?

Yes ☒ No ☐

Gates closed and locked?

Yes ☒ No ☐

Perimeter fence intact and functioning as intended?

Yes ☒ No ☐

Evidence of subsidence or settlement?

Yes ☐ No ☒

Gravel cover in place?

Yes ☒ No ☐

Evidence of deterioration of cover?

Yes ☐ No ☒

Evidence of erosion damage?

Yes ☐ No ☒

Are there woody plants that need to be removed?

Yes ☐ No ☒

Are tar accumulations present at the ground surface near or outside the fence?

Yes ☐ No ☒

Notes: _____

2. SWMU 2 & 6 Soil Cover

Evidence of subsidence or settlement?

Yes ☐ No ☒

Evidence of furrow, ruts, or animal burrows?

Yes ☐ No ☒

Evidence of erosion damage?

Yes ☐ No ☒

Evidence of deterioration of cover?

Yes ☐ No ☒

Vegetative cover in place?

Yes ☒ No ☐

Is the grass overgrown?

Yes ☐ No ☒

New growth of woody plants that need to be removed?

Yes ☐ No ☒

Evidence of water ponding on the surface?

Yes ☐ No ☒

Notes: _____

3. SWMU 11 Soil Cover

Evidence of subsidence or settlement?

Yes ☐ No ☒

Evidence of furrow, ruts, or animal burrows?

Yes ☐ No ☒

Evidence of erosion damage?

Yes ☐ No ☒

Evidence of deterioration of cover?

Yes ☐ No ☒

Vegetative cover in place?

Yes ☒ No ☐

Is the grass overgrown?

Yes ☐ No ☒

Are there woody plants that need to be removed?

Yes ☐ No ☒

Evidence of water ponding on the surface?

Yes ☐ No ☒

Is the surface drain in the southwestern corner clear of debris and functioning as intended?

Yes ☒ No ☐

Notes: _____

4. No. 1 Sludge Pond Soil Cover

Evidence of subsidence or settlement?

Yes ☐ No ☒

Evidence of furrow, ruts, or animal burrows?

Yes ☐ No ☒

Evidence of erosion damage?

Yes ☐ No ☒

Evidence of deterioration of cover?

Yes ☐ No ☒

Vegetative cover in place?

Yes ☒ No ☐

Is the grass overgrown?

Yes ☐ No ☒

Are there woody plants that need to be removed?

Yes ☐ No ☒

Evidence of water ponding on the surface?

Yes ☐ No ☒

Are there any deficiencies in the gravel roadway such that buried waste could be exposed?

Yes ☐ No ☒

Notes: _____

5. No. 2 Sludge Pond Soil Cover

Evidence of subsidence or settlement?

Yes ☐ No ☒

Evidence of furrow, ruts, or animal burrows?

Yes ☐ No ☒

Evidence of erosion damage?

Yes ☐ No ☒

Evidence of deterioration of cover?

Yes ☐ No ☒

Vegetative cover in place?

Yes ☒ No ☐

Is the grass overgrown?

Yes ☐ No ☒

Are there woody plants that need to be removed?

Yes ☐ No ☒

Evidence of water ponding on the surface?

Yes ☐ No ☒

Is the rip rap along the perimeter in place and functioning as intended?

Yes ☒ No ☐

Notes: _____

6. No. 3 Sludge Pond Soil Cover

Evidence of subsidence or settlement?

Yes ☐ No ☒

Evidence of furrow, ruts, or animal burrows?

Yes ☐ No ☒

Evidence of erosion damage?

Yes ☐ No ☒

Evidence of deterioration of cover?

Yes ☐ No ☒

Vegetative cover in place?

Yes ☒ No ☐

Is the grass overgrown?

Yes ☐ No ☒

Are there woody plants that need to be removed?

Yes ☐ No ☒

Evidence of water ponding on the surface?

Yes ☐ No ☒

Notes: _____

7. Former Biobasin No. 1 Cover

Evidence of subsidence or settlement?

Yes ☐ No ☒

Evidence of furrow, ruts, or animal burrows?

Yes ☐ No ☒

Evidence of erosion damage?

Yes ☐ No ☒

Evidence of deterioration of cover?

Yes ☐ No ☒

Vegetative cover in place?

Yes ☒ No ☐

Is the grass overgrown?

Yes ☐ No ☒

Are there woody plants that need to be removed?

Yes ☐ No ☒

Evidence of water ponding on the surface?

Yes ☐ No ☒

Notes: _____

8. Former Biobasin No. 2 Cover

Evidence of subsidence or settlement?

Yes ☐ No ☒

Evidence of furrow, ruts, or animal burrows?

Yes ☐ No ☒

Evidence of erosion damage?

Yes ☐ No ☒

Evidence of deterioration of cover?

Yes ☐ No ☒

Vegetative cover in place?

Yes ☒ No ☐

Is the grass overgrown?

Yes ☐ No ☒

Are there woody plants that need to be removed?

Yes ☐ No ☒

Evidence of water ponding on the surface?

Yes ☐ No ☒

Notes: _____

9. Former Biobasin No. 3 Soil Cover

Evidence of subsidence or settlement?

Yes ☐ No ☒

Evidence of furrow, ruts, or animal burrows?

Yes ☐ No ☒

Evidence of erosion damage?

Yes ☐ No ☒

Evidence of deterioration of cover?

Yes ☐ No ☒

Vegetative cover in place?

Yes ☒ No ☐

Is the grass overgrown?

Yes ☐ No ☒

Are there woody plants that need to be removed?

Yes ☐ No ☒

Evidence of water ponding on the surface?

Yes ☐ No ☒

Notes: _____

10. Former Panic Pond Area Soil Cover

Evidence of subsidence or settlement?

Yes ☐ No ☒

Evidence of furrow, ruts, or animal burrows?

Yes ☐ No ☒

Evidence of erosion damage?

Yes ☐ No ☒

Evidence of deterioration of cover?

Yes ☐ No ☒

Vegetative cover in place?

Yes ☒ No ☐

Is the grass overgrown?

Yes ☐ No ☒

Are there woody plants that need to be removed?

Yes ☐ No ☒

Evidence of water ponding on the surface?

Yes ☐ No ☒

Is the rip rap in the central area in place and functioning as intended?

Yes ☒ No ☐

Is there damage to the concrete or WWTU infrastructure in the western area such that buried waste could be exposed?

Yes ☐ No ☒

Notes: _____

11. Former Equalization Basin

Is there damage to the concrete or WWTU infrastructure such that buried waste could be exposed?

Yes ☐ No ☒

Notes: _____

12. Former Pond Soil Cover

Is there damage to the concrete or WWTU infrastructure such that buried waste could be exposed?

Yes ☐ No ☒

Notes: _____

13. Corrective Actions Completed

Notes: None

Attachment 2
Laboratory Report and Data Quality
Evaluation Memorandum
(provided separately)

Attachment 3

Mass Reduction Plots

Table 3-1. Mann-Kendall Test Results for Total COC Mass After Shutdown
2020 Operation, Maintenance, and Monitoring Activities Memorandum
UCC Institute Facility, Institute, West Virginia

TTZ	Total Sample s	Detect Freq. (%)	Min (kg)	Max (kg)	Mean (kg)	Median (kg)	Std Dev. (kg)	CV	Last Result (kg)	Last Sample Date	MK Test Value (S)	MK p-value	Mann- Kendall Result	Trend Analysis Result	Stability Based on CV
TTZ-3A	4	100	9.98	15.7	12.8	12.7	2.37	0.185	15.7	Dec-20	4	0.167	83.3% (+)	No Trend	Stable
TTZ-3B	6	100	24.1	116	75.3	85.7	38.3	0.509	116	Dec-20	13	0.008	99.2% (sig +)	Strong Increasing	---
TTZ-3C	4	100	5.08	5.90	5.52	5.54	0.35	0.063	5.65	Dec-20	0	0.625	37.5% (+)	No Trend	Stable

Notes:

"---" = not applicable

% = percent

(-) = negative trend

(+) = positive trend

CV = coefficient of variation

Freq. = frequency

Max = maximum

Min = minimum

MK = Mann-Kendall

p-value = probability value

sig = (statistically) significant.

TTZ = target treatment zone

TTZ-3A shutdown: 11/10/2019

TTZ-3B shutdown: 3/10/2019

TTZ-3C shutdown: 11/10/2019

Trend analysis performed using Mann-Kendall single-tailed test at 0.10 significance level:

- A strong trend (either increasing or decreasing) is indicated by a confidence level greater than or equal to 95 percent
- A weak trend (either increasing or decreasing) is indicated by a confidence level less than 95 percent but greater than or equal to 90 percent.
- For data exhibiting no trend at the 90% confidence level, concentrations are deemed stable if the coefficient of variation (CV) is equal to or less than one.

Although the Mann-Kendall test can be performed with 4 independent observations, the power of the test with so few samples is expected to be low.

Table 3-2. Mann-Kendall Test Results for Individual Wells in TTZ-3B After Shutdown
2020 Operation, Maintenance, and Monitoring Activities Memorandum
UCC Institute Facility, Institute, West Virginia

Well	Parameter	Total Samples	Detect Results	Detect Freq. (%)	Min Non-Detect (µg/L)	Min Detect (µg/L)	Max Non-Detect (µg/L)	Max Detect (µg/L)	Mean (µg/L)	Median (µg/L)	Std Dev. (µg/L)	CV	Last Result (µg/L)	Last Sample Date	MK Test Value (S)	MK p-value	Mann-Kendall Result	Trend Analysis Result	Stability Based On CV
TW-98B	Carbon Tetrachloride	6	0	0	0.500	---	50.0	---	---	---	---	---	ND (50)	Dec-20	0	0.577	42.3% (+)	No Trend	>50% ND
	Chloroform	6	6	100	---	74.0	---	150	102	97.5	27.0	0.265	74.0	Dec-20	-3	0.360	64% (-)	No Trend	Stable
	Tetrachloroethene	6	0	0	0.500	---	50.0	---	---	---	---	---	ND (50)	Dec-20	0	0.577	42.3% (+)	No Trend	>50% ND
	Trichlorofluoromethane	6	6	100	---	3,400	---	16,000	10,367	12,000	5,250	0.506	16,000	Dec-20	12	0.018	98.2% (sig +)	Strong Increasing	---
	Total COCs	6	6	100	---	3,481	---	16,074	10,468	12,103	5,238	0.500	16,074	Dec-20	13	0.008	99.2% (sig +)	Strong Increasing	---
TW-99A	Carbon Tetrachloride	6	0	0	0.500	---	100	---	---	---	---	---	ND (100)	Dec-20	0	0.577	42.3% (+)	No Trend	>50% ND
	Chloroform	6	6	100	---	48.0	---	230	123	110	68.3	0.556	230	Dec-20	11	0.028	97.2% (sig +)	Strong Increasing	---
	Tetrachloroethene	6	0	0	0.500	---	100	---	---	---	---	---	ND (100)	Dec-20	0	0.577	42.3% (+)	No Trend	>50% ND
	Trichlorofluoromethane	6	6	100	---	2,100	---	21,000	12,533	13,650	8,812	0.703	21,000	Dec-20	10	0.048	95.2% (sig +)	Strong Increasing	---
	Total COCs	6	6	100	---	2,148	---	21,230	12,656	13,760	8,874	0.701	21,230	Dec-20	11	0.028	97.2% (sig +)	Strong Increasing	---

Notes:
"---" = not applicable
< = less than
% = percent
(-) = negative trend
(+) = positive trend
COC = contaminants of concern
CV = coefficient of variation
Freq. = frequency
Max = maximum
Min = minimum
MK = Mann-Kendall
ND = non-detect
p-value = probability value
sig = (statistically) significant.
TTZ-3C shutdown: 11/10/2019
Trend analysis performed using Mann-Kendall single-tailed test at 0.10 significance level:
• A strong trend (either increasing or decreasing) is indicated by a confidence level greater than or equal to 95 percent
• A weak trend (either increasing or decreasing) is indicated by a confidence level less than 95 percent but greater than or equal to 90 percent.
• For data exhibiting no trend at the 90% confidence level, concentrations are deemed stable if the coefficient of variation (CV) is equal to or less than one.
Non-detects were assigned a common value less than the smallest measured value in the dataset for the Mann-Kendall test. Summary statistics were calculated using the Kaplan-Meier product limit estimator for nondetects.

Figure 3–1. Target Treatment Zone (TTZ) Thiessen Mass Plots

